AD-A069 483 KIMBALL (L ROBERT) AND ASSOCIATES EBENSBURG PA F/G 13/2
NATIONAL DAM SAFETY PROGRAM. ANDOVER ROD AND GUN CLUB DAM, (INV--ETC(U)
SEP 78 R J KIMBALL DACW51-78-C-0025
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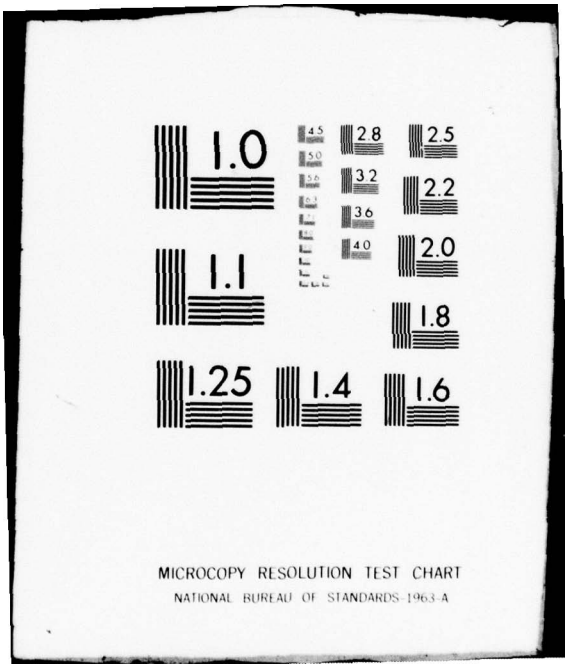
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1.1
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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Phase I Inspection Report
Andover Rod and Gun Club Dam
Genesee River Basin, Allegany County, N.Y.
Inventory No. N.Y. 439

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National Dam Safety Program

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L. Robert Kimball and Associates
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Ebensburg, Pennsylvania

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Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Allegany County
Liberty Brook
Andover Rod and Gun Club Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

The Andover rod and Gun Club Dan was judged to be unsafe non-emergency due to the fact that normal flows pass through the dam rather than over the structure as designed recommendation for immediate repair or breaching of the dam was made.

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SEP 78

NO

DISTRICT ENGINEER, CORPS OF ENGINEERS

XXX NEW YORK DISTRICT, NEW YORK 10007

TO: HONORABLE HUGH L. CAREY

GOVERNOR OF NEW YORK

ALBANY, NEW YORK 12224

INFO: MR. GEORGE KOCH

SUPERVISOR, DAM SAFETY PROGRAM

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL

CONSERVATION

50 WOLF ROAD

ALBANY, NEW YORK 12233

UNCLAS

ENGINEERS FROM THE CONSULTING FIRM OF L. ROBERT KIMBALL AND ASSOCIATES, UNDER CONTRACT TO THE NEW YORK DISTRICT, CORPS OF ENGINEERS INSPECTED THE ANDOVER ROD AND GUN CLUB DAM, ALLEGANY COUNTY, NEW YORK (I.D. NO. 439) ON 31 AUGUST 1978 AS PART OF THE NATIONAL DAM INSPECTION PROGRAM.

VISUAL INSPECTION OF THE ROCK FILLED CRIB DAM REVEALED DETERIORATION OF THE WOOD PLANKING ON THE UPSTREAM FACE OF THE DAM AND LOSS OF APPROXI-

JEROME CASPE, Civ Engr NANEN-F X-9110

CLARK H. BENN, COL, DE, NAN X-0100

02 02

141500Z

UNCLAS

MATELY 40% OF THE STONE FILL IN THE CENTER PORTION OF THE DAM.

THE DAM IS LOCATED WITHIN THE TOWN OF ANDOVER AND FAILURE, PARTICULARLY DURING PERIOD OF HIGH FLOWS COULD CAUSE LOSS OF LIVES.

WE CONSIDER THE ABOVE TO REPRESENT AN UNSAFE CONDITION REQUIRING THE FOLLOWING ACTIONS BY THE OWNER, THE TOWN OF ANDOVER, WITHIN 60 DAYS FROM THE DATE OF THIS NOTIFICATION:

REMOVAL OF THE DAM OR REPAIR OF THE WOOD PLANKING AND RESTORATION OF THE ROCK FILL. IN THE INTERIM THE TOWN SHOULD IMMEDIATELY INITIATE A SYSTEM OF AROUND-THE-CLOCK SURVEILLANCE AND A CONTINGENCY PLAN FOR EVACUATION OF DOWNSTREAM RESIDENTS IN THE EVENT OF OVERTOPPING OR FURTHER DETERIORATION OF THE STRUCTURE.

cf:
Barbero
Weiss
Iarrobino (NAD)
Engrg File
Exec Ofc
Koch, NYS DEC

GENESEE RIVER BASIN

LEVEL II

ANDOVER ROD AND GUN CLUB DAM

ALLEGANY COUNTY, NEW YORK

INVENTORY NUMBER NY 439

PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

Prepared by

L. ROBERT KIMBALL and ASSOCIATES
615 W. Highland Ave. Ebensburg, Pa.

Prepared For

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

TABLE OF CONTENTS

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Andover Rod and Gun Club Dam

State Located: New York

County Located: Allegany

Stream: Liberty Brook, a tributary to Dyke Creek

Date of Inspection: August 31, 1978

ASSESSMENT

Based on our visual inspection and review of available information, the Andover Rod and Gun Club Dam has been assigned an "unsafe, non-emergency" classification. The unsafe classification is assigned based on the following definition provided by the Corps of Engineers: "a dam with deficiencies of such a nature that, if left uncorrected, could result in the failure of the dam with subsequent loss of lives or substantial property damage".

The dam is a timber crib dam with a rock fill. The center crib section has lost 40% of the rock fill due to flow through the dam. Deterioration of the upstream facing boards has permitted all normal flow to exit through the structure rather than over the structure as designed.

It is our opinion that failure of the structure may significantly increase the flooding downstream in Andover, particularly during a minor storm. It is difficult to predict the extent of damage or loss of life which would be experienced due to failure of the dam. However, we feel that the initial flood wave may cause some damage and that it is likely debris from the failure would block the channel downstream,possibly increasing the flooding potential in Andover.

As several houses are located on the stream banks below the dam we have assigned a high hazard rating to the dam.

The dam is a small size structure with a maximum structural height of 9 feet and a normal storage of 118 acre-feet. The condition of the dam, rather than the size leads us to the conclusion that prompt action is necessary to protect downstream residents from increased flooding due to the dam failure.

Either repairs should be made to the dam and completed prior to mid November, 1978, or the structure should be breached and removed to relieve the potential of increased flooding downstream due to failure.

Routine surveillence should be conducted until corrective action is taken.

Results of the hydrologic analysis indicate that overflow capacity of the timber crib section is sufficient to pass the SPF without overtopping the earth embankment section. However, the overflow section provides only 34% of the spillway capacity necessary to control the PMF.

If the structure is repaired, future analyses should be conducted to determine what modifications are necessary to provide adequate controls for the PMF. The stability of the crib section under the maximum water elevation would have to be evaluated.

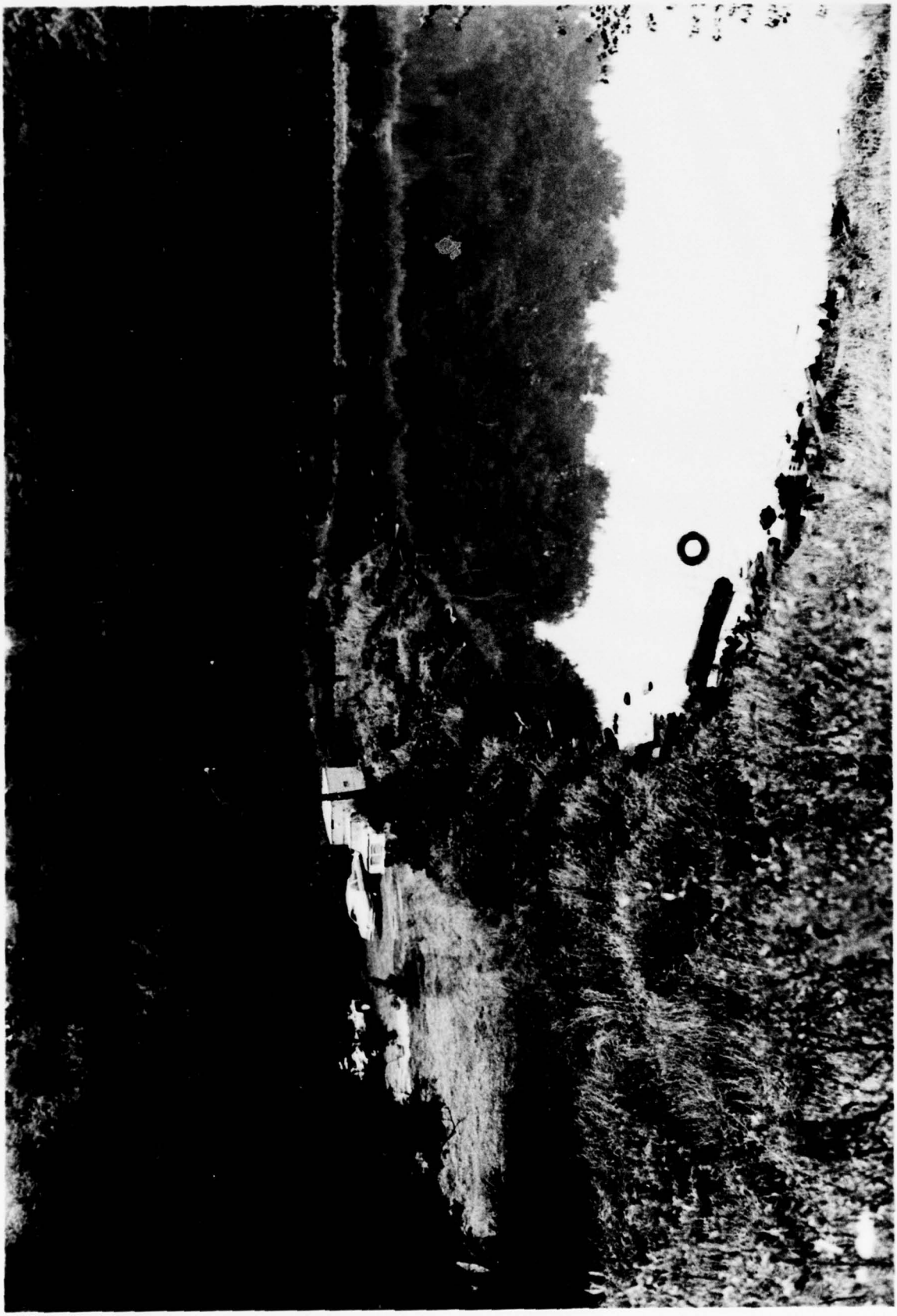
Approved by: R Jeffrey Kimball

R. Jeffrey Kimball, P.E.
L. ROBERT KIMBALL & ASSOCIATES
Registration No. PA 26275E

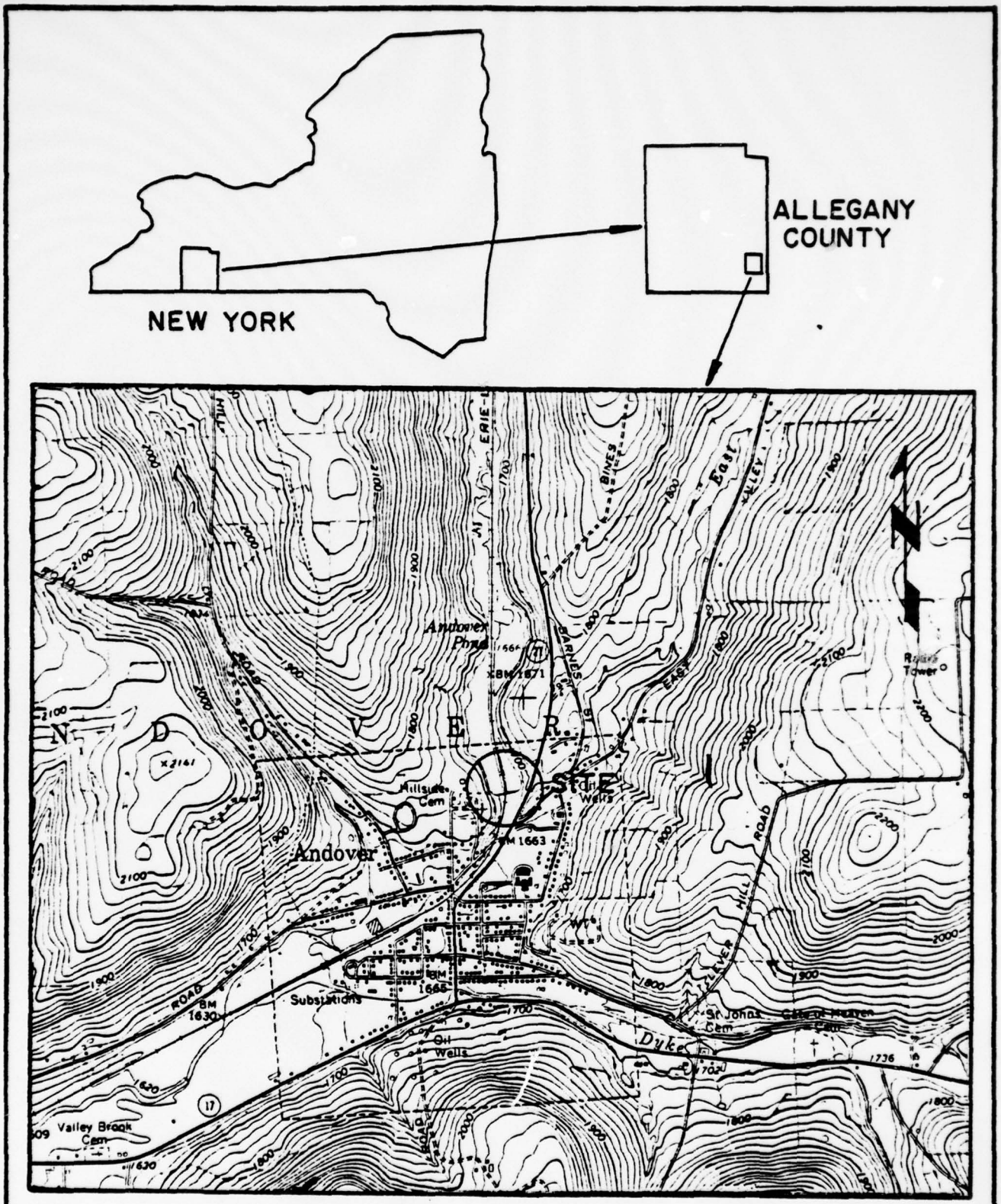
Approved by: Clark H. Benn

CLARK H. BENN
Colonel, Corps of Engineers
District Engineer
28 September 1978

OVERVIEW OF CRIB SECTION
FROM RIGHT ABUTMENT



OVERVIEW OF EARTH SECTION
FROM LEFT ABUTMENT



ANDOVER ROD AND GUN CLUB DAM

SITE LOCATION MAP

SCALE: 1" = 2000'

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
ANDOVER ROD AND GUN CLUB DAM ID # 439

SECTION 1: PROJECT INFORMATION

1.1 General:

a. Authority: Authority is provided by the National Dam Inspection Act Public Law 92-367.
Contract Number: DACW51-78-C-0025

b. Purpose of Project: Evaluation of non-Federal dams to identify dams which are a threat to life or property.

1.2 Description of Project:

a. Description of Dam and Appurtenances: Andover Rod and Gun Club Dam is partially an earthfill and rockfilled timber crib structure. The main part of the dam is constructed of used railroad ties to form cribs 8 feet by 8 feet. There are 13 side by side cribs filled with 3-12 inch size rock. Over the cribs 9.5 feet long by 12 inch wide planks are laid. In addition, planks are used infront to the cribbing and acts as a cutoff. The entire cribbing section is approximately 102 feet long, 9.5 feet wide and 5 feet high. On either end of the crib section are two short abutment sections which are 4 feet higher (total height 9 feet). The 102 feet long main crib section also acts as the spillway. Water flows over the planks and drops 5 feet to the streambed. The entire crib section forms about 1/2 the entire dam length (See drawings Appendix E).

The left abutment section is constructed of an earthfill. The maximum height is about 5 feet. The crest is about 3 feet wide and 250 feet long. The slopes and crest are covered with high grass, several small trees and a few stumps. The upstream and downstream slopes are 2:1. The crib section and the embankment section are separated by a north trending line of the Erie-Lackawanna Railroad. The railroad embankment runs perpendicular to the dam crest and runs the entire length of the reservoir.

An 8 inch steel pipe located near the top of the timber crib section forms the outlet works.

b. Location: The dam is located immediately north of the town of Andover,New York. The location can be found on the Andover, New York, 7.5 minute series U.S.G.S. quadrangle (See Site Location Map).

c. Size Classification: The dam is a small size structure with a height of 9 feet and a storage capacity of 118 acre-feet.

d. Hazard Classification: The Andover Rod and Gun Club Dam is a high hazard potential structure. If failure were to occur, several

homes adjacent to the stream may be flooded or their foundations undercut by the flood flows. In addition, blockage may occur at one of several bridges downstream due to debris from the crib section creating a temporary dam. Several other streams merge downstream adding to the temporary dam inflow, possibly leading to increased flooding.

e. Ownership: The dam is owned by the Town of Andover, New York.

f. Purpose of Dam: The dam is used for recreation and auxilary fire protection.

g. Design and Construction History: The dam is reported to have been constructed in 1851 and used to generate power for saw and grist mills. The original structure was an earthfill dam. The dam was reconstructed in 1951 after a failure of the embankment. The design was completed by the Soil Conservation Service. The failed embankment was removed and the timber crib section installed.

h. Normal Operating Procedures: There are no operating procedures for the dam. Water is retained in the reservoir to the spillway level. No regulation of the reservoir level is conducted.

1.3 Pertinent Data:

a. Drainage Area: The drainage area above the dam is 5.47 square miles. The drainage area is primarily forested or used for pasture land.

b. Discharge at Damsite:

Maximum Known Flood at Damsite: Unknown

Spillway Capacity at Maximum Design Pool Elevation: 1750 cfs

Emergency Spillway Capacity at Maximum Pool Elevation: 2700 cfs

c. Elevation: (feet above MSL)

Top of Dam: 1,670.1

Maximum Pool Design Surcharge: 1,669.0

Normal Pool: 1,666.0

Streambed at Centerline of Dam: Approximately 1,661

Maximum Tailwater Elevation: Unknown

d. Reservoir:

Length of Normal Pool: 4,900 feet

Length of Maximum Pool: 6,500 feet

e. Storage: (acre-feet)

Normal Pool: 118

Design Surcharge: 240

Top of Dam: 294

f. Reservoir Surface: (acres)

Top of Dam: 55

Normal Pool: 24.5

g. Dam:

Type: Earthfill and rockfilled timber crib

Length: 370 feet (Earthfill - 250', crib-120')

Height: 9 feet

Top Width: Earthfill - 3', crib - 9.5'

		Earthfill	Crib
Side slopes:	Upstream	2:1	vertical
	Downstream	2:1	vertical

Zoning: None

Impervious Core: None

Cutoff: None

Grout Curtain: None

h. Outlet Works:

Type: One 8" steel pipe

Length: 12 feet

i. Spillway:

Type: Broad crested weir over crib section

Length: 102 feet

Crest Elevation: 1,666.0 feet

Gates: None

Upstream Channel: None

Downstream Channel: Water flows over weir then drops 5 feet to natural stream bed.

j. Regulating Outlets: One 8" steel pipe located through crib section. Pipe can only draw water down one foot below spillway level. The pipe valve and inlet are partially covered with sediment and vegetation and apparently inoperative.

SECTION 2: ENGINEERING DATA

2.1 Design: No design data was available for the original dam or the earthfill section of the dam. After failure of part of the original dam the Soil Conservation Service designed the rockfilled timber crib section. Construction drawings and hydrographs are available on this portion of the dam.

2.2 Construction: No construction data was available on either the original dam or the present structure.

2.3 Operation: No data is available on the operation of the dam.

2.4 Evaluation: Little or no data is available to perform a detailed investigation of the structure.

SECTION 3: VISUAL INSPECTION

3.1 Findings:

a. General: The Andover Rod and Gun Club Dam was inspected by L. Robert Kimball and Associates personnel on August 31, 1978 accompanied by Howard Burdick, supervisor of the Town of Andover.

b. Dam: Visual inspection revealed a large hole in the center portion of the timber crib section. The upstream planking was broken and missing and one of the downstream cross ties was absent. Approximately 40 percent of the rockfill was removed. All discharge (estimated at .75 cfs or 337 gal/min) was through this portion of the dam (See cross section Appendix E).

The planking on the top of the dam has an undulating surface caused by warping, settlement, or lack of support from broken cross ties. Beneath this planking on the right abutment approximately 1 foot of rock is missing.

The earthfill section appears to be part of the original dam. High grass and small trees made visual inspection difficult. The slopes are moderately steep and the crest is very narrow.

c. Appurtenant Structures: The emergency spillway is formed by the timber crib section and is described above. Because of the hole in the timber crib section no water was flowing over the spillway. Water level at the time of the inspection was 1 foot below the spillway crest. Provisions were made at the time of design for flashboards to be installed. It appears that these were never used and are currently inoperative.

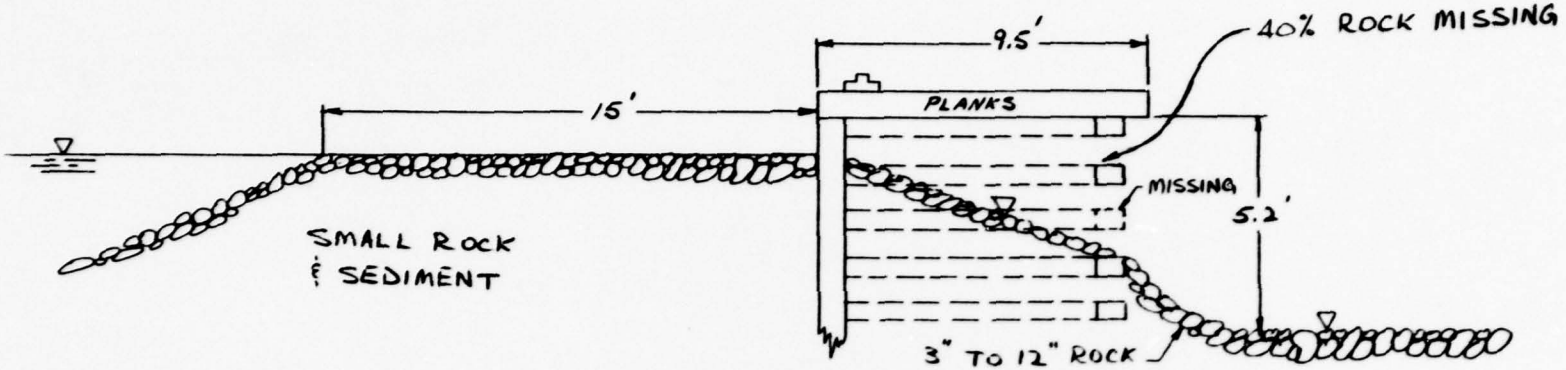
The 8 inch steel pipe outlet is inoperative. The intake box is filled with sediment. The pipe is capable of drawing the reservoir down 1 foot (entrance invert 1,665.0').

d. Reservoir Area: The reservoir is reportedly only 4 to 5 feet deep. Considerable sedimentation has occured against the upstream face of the timber crib section. The level of sedimentation in this area is 1 foot below spillway elevation (1,665.0'). The reservoir is rimmed with forest and pasture land. The railroad embankment runs the entire length of the reservoir.

e. Downstream Channel: The downstream channel is narrow but relatively deep (10'). The channel passes through a portion of the Town of Andover.

3.2 Evaluation: The visual inspection revealed the timber crib section of the dam to be in a severe state of disrepair. Water is flowing though the dam instead of over the dam. Maintenance of the structure appears to be nonexistent.

The heavy vegetation made inspection of the earthfill section difficult. No signs of instability were noted on the embankment. The embankment does not meet current state of the art design criteria.



MAXIMUM SECTION
LEAKAGE SECTION
SCALE: 1" = 5'

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures: There is no defined operational plan. No regulation of the water level is performed.

4.2 Maintenance of Dam: Maintenance of the dam is severly lacking.

4.3 Maintenance of Operating Facilities: There are no operating facilities.

4.4 Description of Any Warning System in Effect: None

4.5 Evaluation: No maintenance or operation of the dam is performed. This lack of maintenance is affecting the stability of the structure.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Hydrologic Evaluation of Features:

a. Design Data: The SCS performed a flood routing of the dam for their design of the timber crib section. The spillway is designed to pass 1,577 cfs with a maximum water level of 1,669.0 feet.

b. Experience Record: No records are kept on the water level or discharge. The dam survived Hurricane Agnes, June, 1972.

c. Visual Observations: The outlet works (8" pipe) is inoperative. Currently all flow is through the dam instead of over the spillway. Considerable maintenance needs to be performed on the spillway and timber crib section.

d. Overtopping Analysis: Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and subsequent routing of the PMF through the reservoir system. The PMF is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration losses, and concentration of run-off at a specific location, that is considered reasonably possible for a particular drainage area.

The drainage area contributing to Andover Rod and Gun Club Dam is approximately 5.47 square miles. To develop the basic hydrologic working tool, the unit hydrograph, Snyder Coefficients were used. After discussions with the Corps of Engineers personnel, assumed parameters of Cp=0.60 and Ct=2.0 were used. A value of Tp equal to 4.5 hours was calculated considering watershed size and shape.

Using Hydrometeorological Report No. 33, the PMP index rainfall was determined to be 22.5 inches for a 24 hour duration, 200 square mile basin. The percentages of the index rainfall applied to other durations were interpolated from the plot of drainage area versus percent of 24 hours,200 square mile. The computed PMF flow was 8137 cfs. After routing the PMF through the impounded storage, the peak flow was reduced to 7906 cfs. A plot of the PMF inflow and outflow hydrographs is included in Appendix B.

The PMF outflow is equivalent to a water elevation of 4' above the top of the dam neglecting flow over the earth section. The present spillway has the capacity to control only 34% of the required overflow.

The ability of the Andover Rod and Gun Club Dam to discharge the Standard Project Flood (SPF) was also evaluated. The inflow hydrograph for the standard project flood with a peak flow of 2744 cfs was calculated from the unit hydrograph. Routing through the impounded storage reduced the flow to 2650 cfs. The SPF outflow is indicative of a pool elevation of 1070.0 feet above MSL leaving 0.1 feet of freeboard remaining. The SPF corresponds to 1/2 PMF.

To allow inflow and outflow hydrographs to be developed and routed several assumptions were made.

1. Flow only over the timber crib section was assumed.

2. Storage in the main reservoir was calculated from the USGS quadrangles.

SUMMARY OF HYDROLOGIC ANALYSIS
ANDOVER ROD AND GUN CLUB DAM

Elevation Top of Dam: 1,670.1 feet

Elevation Crest of Spillway: 1,666.0 feet

PMF ROUTING

PMF Peak: 8137 cfs

PMF After Routing through Reservoir: 7906 cfs

Elevation of Routed PMF Corresponding to 7906 cfs: 1674.3 ±

Dam Overtopped: 4.3 feet

Spillway Surcharge: 8.3 feet

SPF ROUTING

SPF Peak: 2744 cfs

SPF After Routing Through Reservoir: 2650 cfs

Elevation of Routed SPF Corresponding to 2650 cfs: 1670.0 feet

Freeboard Remaining: 0.1 feet

Spillway Surcharge: 4.0 feet

5.2 Hydraulic Evaluations of Flood Wave: For the dam break analysis the flood wave for both total and partial failures was computed. Andover Dam is a partial rockfilled timber crib dam and earthfill dam making partial failure the most likely of the two cases.

The calculations indicate that for a full breach a water depth of 4.5 feet would be expected 2000 feet downstream. For a partial breach the depth of water 400 feet downstream would be 4 feet. Neither analysis consider the effect of timbers blocking the downstream bridges causing a temporary dam.

Calculated water depths are included in Appendix B.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability:

a. Visual Observations: The timber crib section of the dam is in a metastable condition. Part of the section has been damaged and is in severe need of repair. The earthfill portion appeared to be stable but will not meet current criteria.

b. Design and Construction Data: No data is available on stability

c. Operating Records: None available

d. Post Construction Changes: The timber crib section was added in in 1951. No structural stability data.

e. Seismic Stability: The dam is located in seismic zone 1 and should not present any problems if static conditions are favorable.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment:

a. Safety: The condition of the dam indicates that the dam is an unsafe, non-emergency structure.

The center crib section has lost 40 percent of the rockfill due to flow through the dam. Deterioration of the upstream facing boards has permitted all normal flow to exit through the structure rather than over the structure.

It is our opinion that failure of the structure may significantly increase the flooding downstream in Andover. It is difficult to predict the extent of damage or loss of life which would be experienced due to failure of the dam. However, we feel that the initial flood wave may cause some damage and that it is likely debris from the failure would block the channel downstream possibly increasing the flooding potential in Andover.

b. Adequacy of Information: The engineering data available is inadequate to perform a detailed structural analysis of the dam.

c. Urgency: Repairs to the structure should be completed within a reasonable time frame not to exceed 60 days or the dam should be breached and removed to relieve the potential of increased flooding downstream due to failure.

Routine surveillence should be conducted until corrective action is taken.

d. Necessity for Additional Work: Additional studies to determine the condition of the earthfill section are recommended.

7.2 Recommendations:

1. Repair the timber crib section.

2. Dredge the reservoir in the area adjacent to the upstream face.

3. Perform a stability analysis of the earthfill embankment.

APPENDIX A

GEOLOGY

ANDOVER ROD AND GUN CLUB DAM

The Andover Rod and Gun Club Dam lies in the Alleghany highlands part of the Appalachian Uplands. The area was glaciated during the Pleistocene which left deposits of clays, silts, sands and gravels. The bedrock in this area consists of Upper Devonian shale, siltstone and sandstone belonging to the Machias Formation, part of the Canadaway Group. There are no major structural features in the area. The strata are relatively flatlying although they have been uplifted and dissected.

APPENDIX B

HYDROLOGIC COMPUTATIONS

ANDOVER ROD AND GUN CLUB DAM

DRAINAGE AREA

FROM ENGINEER'S REPORT:
AREA = 5.97 SQ. MI.

PRECIPITATION

FROM HYDROMETEOROLOGICAL REPORT 33,
PROBABLE MAXIMUM PRECIP. INDEX = 22.5"
(FOR 200 SQ. MI. - 24 HR.)

DEPTH-AREA-DURATION RELATIONSHIP (ZONE 2)
(USING 10 SQ. MI. CONSIDERED POINT AREA)

6 HR.	—	117%
12 HR.	—	126%
24 HR.	—	141%
48 HR.	—	152%

FROM EM 1110-2-1911
STAINDARD PROJECT PRECIP. INDEX = 10"

SNYDER COEFFICIENTS

LENGTH OF MAIN CHANNEL:
L = 5.3 MI.

CENTROIDAL LENGTH ALONG MAIN CHANNEL:
L_{CA} = 2.8 MI.

N.Y. DAM INSP. OSG 8/29/78

ANDOVER ROD AND GUN CLUB DAM

SNYDER'S LAG TIME:

$$t_{pR} = C_t(.955)(L \times L_{CA})^{.3} + .25\, t_R$$

$$= (2.0)(.955)(5.3 \times 2.8)^{.3} + .25(1.0)$$

$$= 4.5 \text{ HR.}$$

UNIT HYDROGRAPH PEAK DISCHARGE:

$$Q_{pR} = \frac{640\, C_p\, A}{t_{pR}}$$

$$= \frac{(640)(0.6)(5.47)}{4.5}$$

$$= 467 \text{ CFS}$$

C_t AND C_p ASSUMED BASED ON MODELS OF SIMILAR AREAS

ANDOVER ROD AND GUN CLUB DAM

ELEVATION - DISCHARGE RELATIONSHIP

$Q = 3.3 L H^{3/2}$ C FROM DESIGN CALCULATIONS

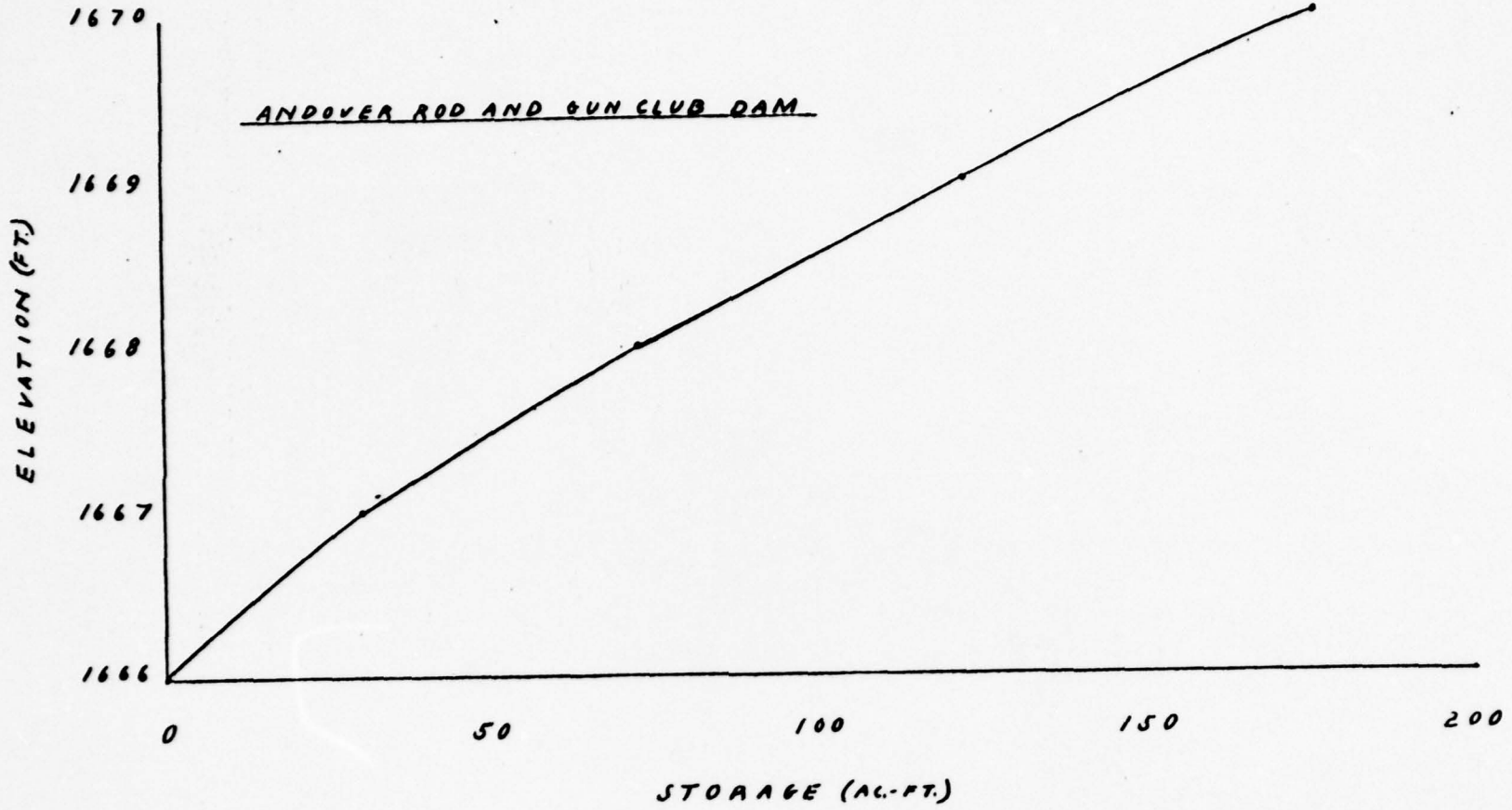
ELEV. (FT)	L (FT)	H (FT)	Q (CFS)
1666	102	0	0
1667	102	1.0	337
1668	102	2.0	952
1669	102	3.0	1749
1670	102	4.0	2693
1671	102	5.0	3763
1672	102	6.0	4947

NEW YORK DAM INSP. DSG 8/29/78

ANDOVER ROD AND GUN CLUB DAM

ELEVATION-STORAGE RELATIONSHIP

ELEV. (FT.)	SURFACE AREA (ACRES)	ΔELEV. (FT.)	TOTAL STORAGE (AC-FT)	TOTAL DISCHARGE (CFS)
1666	24.5		0	0
		1		
1667	35.8		30	337
		1		
1668	48.6		72	952
		1		
1669	51.6		122	1749
		1		
1670	54.8		176	2693
		1		
1671	58.0		232	3763
		1		
1672	61.2		292	4947


ANDOVER ROD AND GUN CLUB DAM
1670
1669
1668
1667
1666
ELEVATION (FT.)
0
50
100
150
200
STORAGE (AC.-FT.)

ANDOVER POND

HYDRAULIC EVALUATION OF FLOOD WAVE

$$Q_{MAX} = .29\sqrt{g}\, K^{.28} W_b D_b^{1.5}$$

$$S_i = \frac{12 V_b}{Q_{MAX}} \qquad V_b = 294 \text{ A.F.} \text{ @ TOP OF DAM}$$

$$\frac{\text{ATT. } Q_{MAX}}{Q_{MAX}} = \frac{0.91 S_i}{S_i + T_s}$$

WHERE:

$$K = \frac{W_d}{W_b} \cdot \frac{Y_o}{D_b}$$

$$T_s = L t_s$$

$$t_s = \Delta S / \Delta Q$$

A) FULL BREACH

$W_b = W_d = 118'$

$D_b = Y_o = 9'$

$Q_{MAX} = 5355$ cfs

ANDOVER POND

		DIST. FROM DAM
REACH 1	L = 400'	400'

D_{DS} = 8' W = 125' D_{AVE} = 8.3'

WATER SURFACE EL. 1668'

Q_{MAX} = 4750 cfs

REACH 2	L = 1600'	2000'

D_{DS} = 4.5' W = 290' D_{AVE} = 5.7'

WATER SURFACE EL. 1654.5'

Q_{MAX} = 4650 cfs

REACH 3	L = 1600'	3600'

D_{DS} = 4.0' W = 290' D_{AVE} = 4.2'

WATER SURFACE EL. 1644'

Q_{MAX} = 3900 cfs

REACH 4	L = 1450'	5050'

D_{DS} = 3.0' W = 400' D_{AVE} = 3.3'

WATER SURFACE EL. 1635'

Q_{MAX} = 3500 cfs.

ANDOVER POND

B) PARTIAL BREACH

$W_b = 24'$ $D_b = Y_o = 9'$

$Q_{MAX} = 1090$ cfs

DIST. FROM DAM

REACH 1 $L = 400'$ 400'

$D_{DS} = 4.0'$ $W = 75'$ $D_{AVE} = 5.7'$

WATER SURFACE EL. 1664'

$Q_{MAX} = 1010$ cfs

BY INSPECTION, THE FLOOD WAVE DEPTH BELOW REACH 2 IS THREE FOOT OR LESS IN DEPTH.

****
HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01
****

ANDOVER ROD AND GUN CLUB DAM
RESERVOIR AT SPILLWAY LEVEL
TEST SPF

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	1	0	0	0	0	0	2	0	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	5.47	0.0	5.47	0.0	0.0	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.777

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.50	0.10	0.0	0.01

UNIT HYDROGRAPH DATA

TP 4.50 CP 0.60 NTA 0

RECESSION DATA

STRTQ 5.47 QRCSN -0.35 RTIOR 3.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC 5.10 AND R 4.57 INTERVALS

UNIT HYDROGRAPH 27 END-OF-PERIOD ORDINATES. LAG 4.50 HOURS. CP 0.60 VOL 1.00

43.	155.	300.	418.	464.	422.	340.	273.	219.	176.
141.	114.	91.	73.	59.	47.	38.	30.	24.	20.
16.	13.	10.	8.	7.	5.	4.			

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.00	0.00	5.
2	0.00	0.00	4.
3	0.00	0.00	4.
4	0.00	0.00	4.
5	0.00	0.00	3.
6	0.00	0.00	3.
7	0.01	0.00	3.
8	0.01	0.00	2.
9	0.01	0.00	2.
10	0.01	0.00	2.
11	0.01	0.00	2.
12	0.01	0.00	2.
13	0.02	0.00	1.
14	0.03	0.00	1.
15	0.03	0.00	1.
16	0.08	0.00	1.
17	0.03	0.00	1.
18	0.02	0.00	1.
19	0.00	0.00	2.
20	0.00	0.00	2.
21	0.00	0.00	1.
22	0.00	0.00	1.
23	0.00	0.00	1.

24	0.00	0.00	1.
25	0.01	0.00	1.
26	0.01	0.00	1.
27	0.01	0.00	1.
28	0.01	0.00	1.
29	0.01	0.00	1.
30	0.01	0.00	1.
31	0.02	0.00	0.
32	0.02	0.00	0.
33	0.02	0.00	0.
34	0.02	0.00	1.
35	0.02	0.00	1.
36	0.02	0.00	1.
37	0.10	0.00	1.
38	0.11	0.00	1.
39	0.14	0.00	1.
40	0.36	0.00	2.
41	0.13	0.00	2.
42	0.10	0.00	3.
43	0.01	0.00	4.
44	0.01	0.00	4.
45	0.01	0.00	4.
46	0.01	0.00	3.
47	0.01	0.00	3.
48	0.01	0.00	2.
49	0.05	0.00	2.
50	0.05	0.00	2.
51	0.05	0.00	2.
52	0.05	0.00	2.
53	0.05	0.00	2.
54	0.05	0.00	2.
55	0.17	0.07	5.
56	0.17	0.07	16.
57	0.17	0.07	37.
58	0.17	0.07	67.
59	0.17	0.07	100.

60	0.17	0.07	130.
61	0.73	0.63	179.
62	0.87	0.77	291.
63	1.09	0.99	505.
64	2.76	2.66	899.
65	1.02	0.92	1478.
66	0.80	0.70	2101.
67	0.10	0.00	2573.
68	0.10	0.00	2744.
69	0.10	0.00	2579.
70	0.10	0.00	2211.
71	0.10	0.00	1811.
72	0.10	0.00	1456.
73	0.00	0.00	1170.
74	0.00	0.00	952.
75	0.00	0.00	853.
76	0.00	0.00	764.
77	0.00	0.00	684.
78	0.00	0.00	613.
79	0.01	0.00	549.
80	0.01	0.00	492.
81	0.01	0.00	441.
82	0.01	0.00	395.
83	0.01	0.00	354.
84	0.01	0.00	317.
85	0.04	0.00	284.
86	0.04	0.00	255.
87	0.06	0.00	228.
88	0.14	0.04	204.
89	0.05	0.00	183.
90	0.04	0.00	164.
91	0.01	0.00	147.
92	0.01	0.00	132.
93	0.01	0.00	118.
94	0.01	0.00	106.
95	0.01	0.00	95.

96	0.01	0.00	85.
97	0.0	0.0	76.
98	0.0	0.0	68.
99	0.0	0.0	61.
100	0.0	0.0	55.
SUM	11.13	7.13	29128.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2744.	2337.	1105.	404.	29126.
INCHES		3.97	7.52	8.24	8.26
AC-FT		1159.	2193.	2404.	2408.

#OVF#

STATION 1

INFLOW I , OUTFLOW O AND OBSERVED FLOW *

	0.	400.	800.	1200.	1600.	2000.	2400.	2800.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	PRECIP L 2.	AND EXC 1.
1	I	.	.	.	.	.	.	.	.	.	.	.
2	I	.	.	.	.	.	.	.	.	.	.	.
3	I	.	.	.	.	.	.	.	.	.	.	.
4	I	.	.	.	.	.	.	.	.	.	.	.
5	I	.	.	.	.	.	.	.	.	.	.	.
6	I	.	.	.	.	.	.	.	.	.	.	.
7	I	.	.	.	.	.	.	.	.	.	.	.
8	I	.	.	.	.	.	.	.	.	.	.	.
9	I	.	.	.	.	.	.	.	.	.	.	.
10	I	.	.	.	.	.	.	.	.	.	.	.
11	I	.	.	.	.	.	.	.	.	.	.	.
12	I	.	.	.	.	.	.	.	.	.	.	.
13	I	.	.	.	.	.	.	.	.	.	.	.
14	I	.	.	.	.	.	.	.	.	.	.	.
15	I	.	.	.	.	.	.	.	.	.	.	.
16	I	.	.	.	.	.	.	.	.	.	.	.
17	I	.	.	.	.	.	.	.	.	.	.	.
18	I	.	.	.	.	.	.	.	.	.	.	.
19	I	.	.	.	.	.	.	.	.	.	.	.
20	I	.	.	.	.	.	.	.	.	.	.	.
21	I	.	.	.	.	.	.	.	.	.	.	.
22	I	.	.	.	.	.	.	.	.	.	.	.
23	I	.	.	.	.	.	.	.	.	.	.	.
24	I	.	.	.	.	.	.	.	.	.	.	.
25	I	.	.	.	.	.	.	.	.	.	.	.
26	I	.	.	.	.	.	.	.	.	.	.	.
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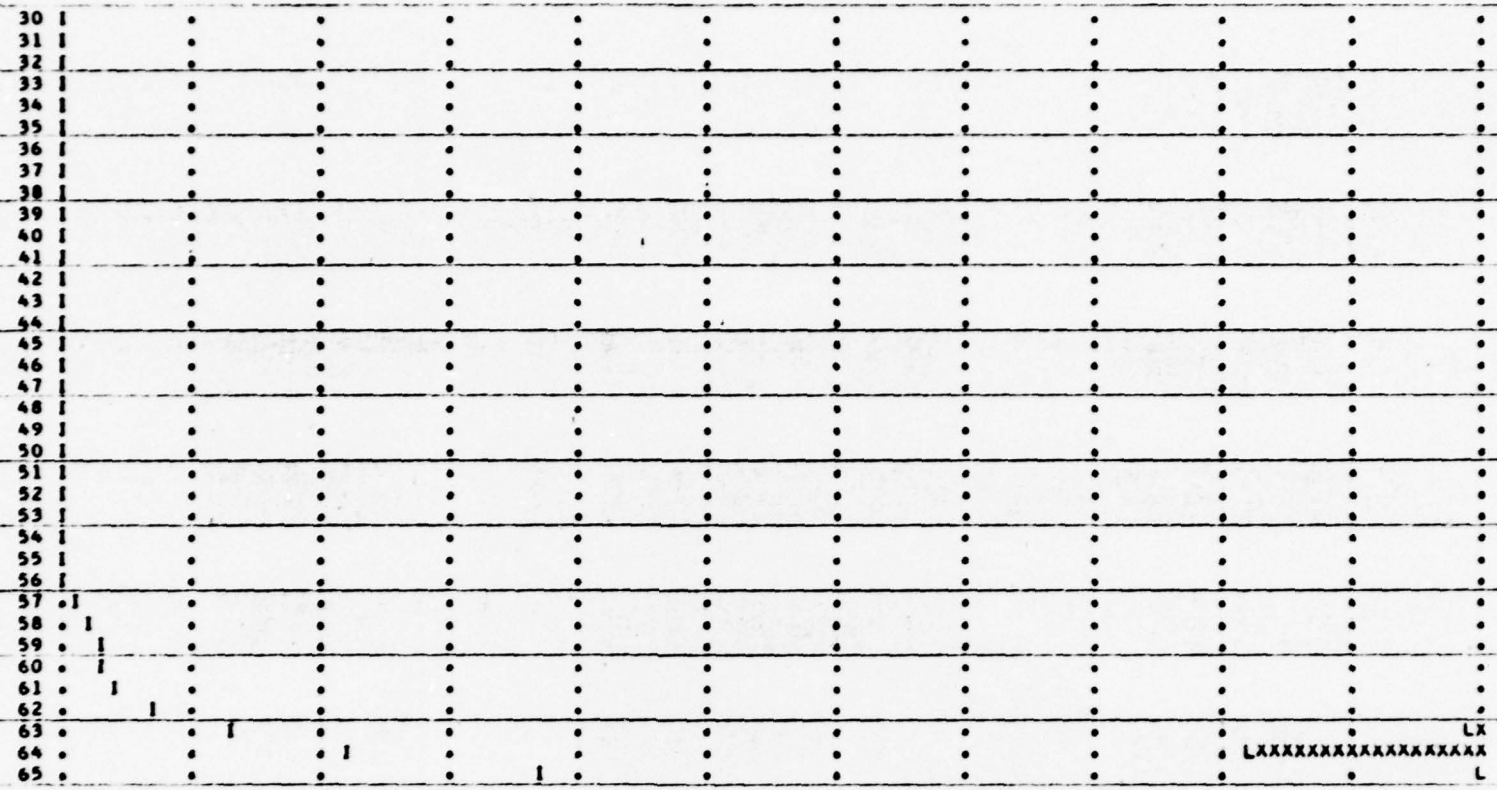
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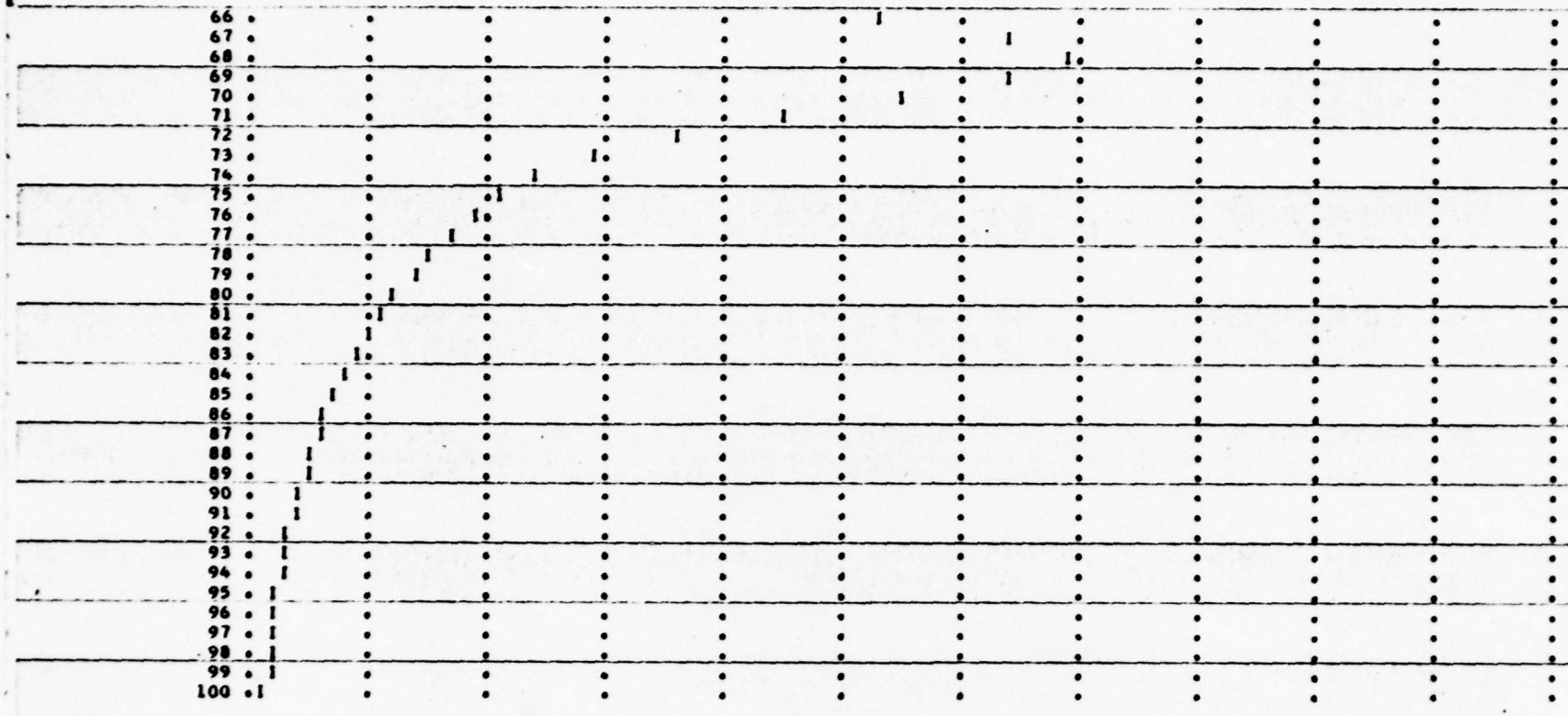
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OVN

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
2	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE	0.	30.	72.	122.	176.	232.	292.	0.	0.	0.
OUTFLOW	0.	337.	952.	1749.	2693.	3763.	4947.	0.	0.	0.

TIME	EOP STOR	AVG IN	EOP OUT
1	0.	5.	5.
2	0.	5.	5.
3	0.	4.	4.
4	0.	4.	4.
5	0.	3.	4.
6	0.	3.	3.
7	0.	3.	3.
8	0.	2.	3.
9	0.	2.	2.
10	0.	2.	2.
11	0.	2.	2.
12	0.	2.	2.
13	0.	2.	2.
14	0.	1.	1.
15	0.	1.	1.
16	0.	1.	1.
17	0.	1.	1.

18	0.	1.	1.
19	0.	2.	1.
20	0.	2.	2.
21	0.	1.	1.
22	0.	1.	1.
23	0.	1.	1.
24	0.	1.	1.
25	0.	1.	1.
26	0.	1.	1.
27	0.	1.	1.
28	0.	1.	1.
29	0.	1.	1.
30	0.	1.	1.
31	0.	0.	1.
32	0.	0.	0.
33	0.	0.	0.
34	0.	1.	0.
35	0.	1.	1.
36	0.	1.	1.
37	0.	1.	1.
38	0.	1.	1.
39	0.	1.	1.
40	0.	1.	1.
41	0.	2.	2.
42	0.	3.	2.
43	0.	4.	3.
44	0.	4.	4.
45	0.	4.	4.
46	0.	4.	4.
47	0.	3.	3.
48	0.	3.	3.
49	0.	2.	2.
50	0.	2.	2.
51	0.	2.	2.
52	0.	2.	2.
53	0.	2.	2.

54	0.	2.	2.
55	0.	3.	3.
56	1.	10.	7.
57	2.	27.	20.
58	4.	52.	40.
59	6.	84.	68.
60	9.	115.	98.
61	12.	155.	134.
62	18.	235.	198.
63	29.	398.	324.
64	48.	702.	607.
65	78.	1188.	1050.
66	115.	1790.	1637.
67	149.	2337.	2218.
68	170.	2659.	2587.
69	174.	2662.	2650.
70	161.	2395.	2436.
71	141.	2011.	2080.
72	119.	1634.	1708.
73	100.	1313.	1394.
74	83.	1061.	1129.
75	72.	902.	949.
76	65.	808.	843.
77	58.	724.	753.
78	53.	649.	674.
79	48.	581.	604.
80	44.	521.	541.
81	40.	467.	485.
82	37.	418.	435.
83	34.	375.	389.
84	31.	336.	349.
85	28.	301.	316.
86	26.	269.	287.
87	23.	241.	258.
88	21.	216.	232.
89	18.	194.	208.

90	17.	174.	186.
91	15.	156.	167.
92	13.	139.	149.
93	12.	125.	134.
94	11.	112.	120.
95	10.	100.	107.
96	9.	90.	96.
97	8.	80.	86.
98	7.	72.	77.
99	6.	65.	69.
100	6.	58.	62.
SUM			29068.

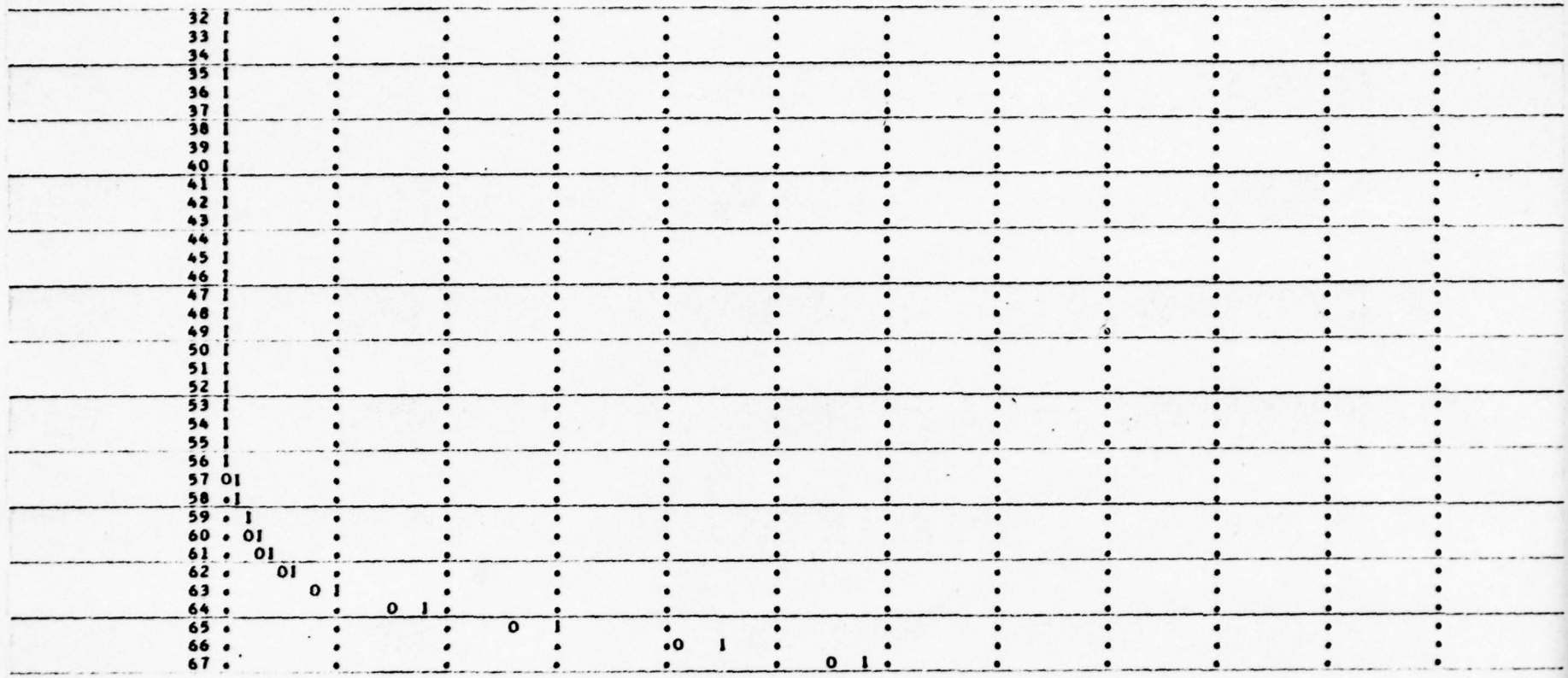
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2650.	2280.	1102.	403.	29068.
INCHES		3.88	7.50	8.22	8.24
AC-FT		1131.	2187.	2399.	2404.

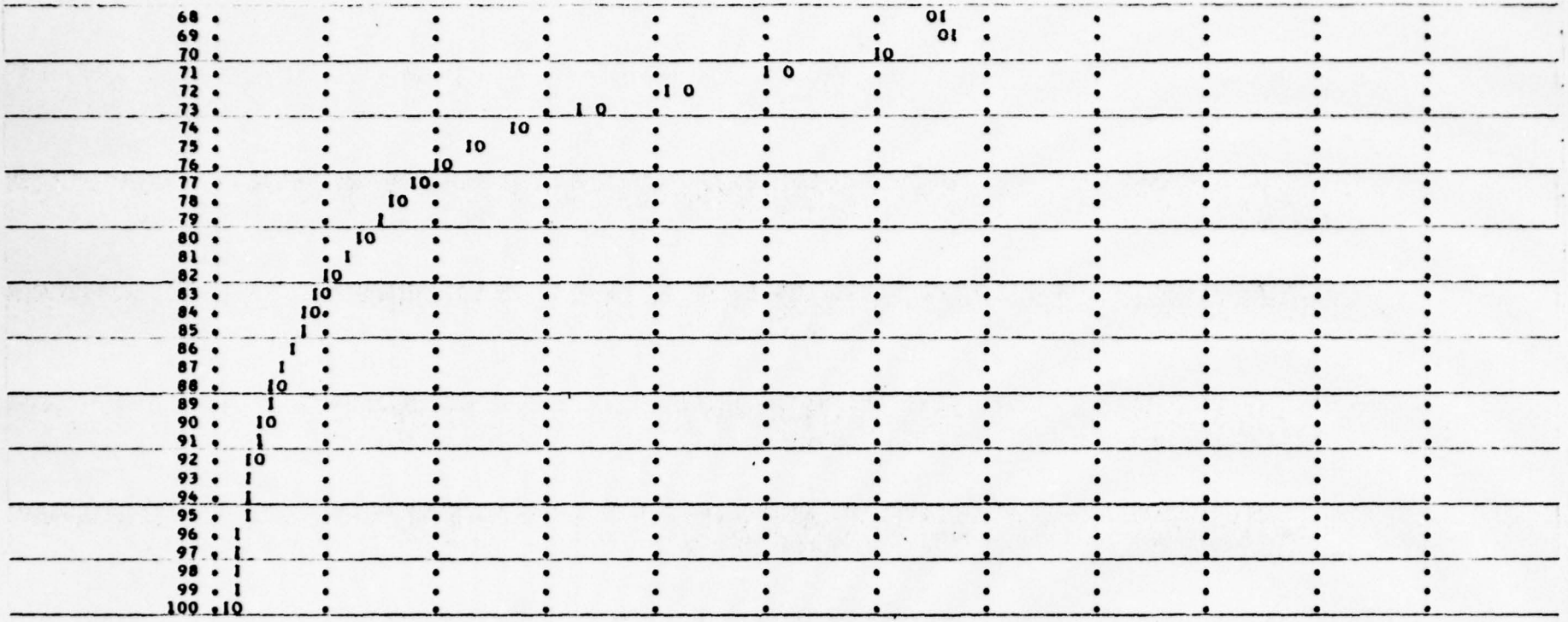
OVF

STATION 2

INFLOW I • OUTFLOW O AND OBSERVED FLOW *

	0.	400.	800.	1200.	1600.	2000.	2400.	2800.	0.	0.	0.	0.
1	I	•	•	•	•	•	•	•	•	•	•	•
2	I	•	•	•	•	•	•	•	•	•	•	•
3	I	•	•	•	•	•	•	•	•	•	•	•
4	I	•	•	•	•	•	•	•	•	•	•	•
5	I	•	•	•	•	•	•	•	•	•	•	•
6	I	•	•	•	•	•	•	•	•	•	•	•
7	I	•	•	•	•	•	•	•	•	•	•	•
8	I	•	•	•	•	•	•	•	•	•	•	•
9	I	•	•	•	•	•	•	•	•	•	•	•
10	I	•	•	•	•	•	•	•	•	•	•	•
11	I	•	•	•	•	•	•	•	•	•	•	•
12	I	•	•	•	•	•	•	•	•	•	•	•
13	I	•	•	•	•	•	•	•	•	•	•	•
14	I	•	•	•	•	•	•	•	•	•	•	•
15	I	•	•	•	•	•	•	•	•	•	•	•
16	I	•	•	•	•	•	•	•	•	•	•	•
17	I	•	•	•	•	•	•	•	•	•	•	•
18	I	•	•	•	•	•	•	•	•	•	•	•
19	I	•	•	•	•	•	•	•	•	•	•	•
20	I	•	•	•	•	•	•	•	•	•	•	•
21	I	•	•	•	•	•	•	•	•	•	•	•
22	I	•	•	•	•	•	•	•	•	•	•	•
23	I	•	•	•	•	•	•	•	•	•	•	•
24	I	•	•	•	•	•	•	•	•	•	•	•
25	I	•	•	•	•	•	•	•	•	•	•	•
26	I	•	•	•	•	•	•	•	•	•	•	•
27	I	•	•	•	•	•	•	•	•	•	•	•
28	I	•	•	•	•	•	•	•	•	•	•	•
29	I	•	•	•	•	•	•	•	•	•	•	•
30	I	•	•	•	•	•	•	•	•	•	•	•
31	I	•	•	•	•	•	•	•	•	•	•	•

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84 10
85 1
86 1
87 1
88 10
89 1
90 10
91 1
92 10
93 1
94 1
95 1
96 1
97 1
98 1
99 1
100 10

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	2744.	2337.	1105.	404.	5.47
ROUTED TO	2	2650.	2280.	1102.	403.	5.47

****
HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01
****

ANDOVER ROD AND GUN CLUB DAM
RESERVOIR AT SPILLWAY LEVEL
TEST PMF

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	1	0	0	0	0	0	2	0	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	5.47	0.0	5.47	0.0	0.0	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	22.50	117.00	126.00	141.00	152.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.777

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.50	0.10	0.0	0.01

UNIT HYDROGRAPH DATA

TP 4.50 CP 0.60 NTA 0

RECESSION DATA

STRTQ 5.47 QRCSN -0.35 RTIOR 3.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC 5.10 AND R 4.57 INTERVALS

UNIT HYDROGRAPH 27 END-OF-PERIOD ORDINATES, LAG 4.50 HOURS, CP 0.60 VOL 1.00

43.	155.	300.	418.	464.	422.	340.	273.	219.	176.
141.	114.	91.	73.	59.	47.	38.	30.	24.	20.
16.	13.	10.	8.	7.	5.	4.			

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.01	0.00	5.
2	0.01	0.00	4.
3	0.01	0.00	4.
4	0.01	0.00	4.
5	0.01	0.00	3.
6	0.01	0.00	3.
7	0.02	0.00	3.
8	0.02	0.00	3.
9	0.02	0.00	2.
10	0.02	0.00	2.
11	0.02	0.00	2.
12	0.02	0.00	2.
13	0.16	0.00	2.
14	0.19	0.00	2.
15	0.24	0.00	2.
16	0.61	0.01	3.
17	0.22	0.07	7.
18	0.18	0.08	20.
19	0.02	0.00	39.
20	0.02	0.00	58.
21	0.02	0.00	70.
22	0.02	0.00	70.
23	0.02	0.00	60.

24	0.02	0.00	49.
25	0.17	0.08	42.
26	0.17	0.08	47.
27	0.17	0.08	63.
28	0.17	0.08	90.
29	0.17	0.08	121.
30	0.17	0.08	150.
31	0.26	0.16	177.
32	0.26	0.16	209.
33	0.26	0.16	250.
34	0.26	0.16	299.
35	0.26	0.16	349.
36	0.26	0.16	394.
37	2.05	1.95	506.
38	2.46	2.36	829.
39	3.07	2.97	1476.
40	7.78	7.68	2660.
41	2.87	2.77	4378.
42	2.25	2.15	6212.
43	0.26	0.16	7604.
44	0.26	0.16	8137.
45	0.26	0.16	7709.
46	0.26	0.16	6697.
47	0.26	0.16	5592.
48	0.26	0.16	4606.
49	0.0	0.0	3805.
50	0.0	0.0	3142.
51	0.0	0.0	2707.
52	0.0	0.0	2425.
53	0.0	0.0	2173.
54	0.0	0.0	1947.
55	0.0	0.0	1744.
56	0.0	0.0	1563.
57	0.0	0.0	1400.
58	0.0	0.0	1255.
59	0.0	0.0	1124.

60	0.0	0.0	1007.
61	0.0	0.0	902.
62	0.0	0.0	808.
63	0.0	0.0	724.
64	0.0	0.0	649.
65	0.0	0.0	581.
66	0.0	0.0	521.
67	0.0	0.0	467.
68	0.0	0.0	418.
69	0.0	0.0	375.
70	0.0	0.0	336.
71	0.0	0.0	301.
72	0.0	0.0	269.
73	0.0	0.0	241.
74	0.0	0.0	216.
75	0.0	0.0	194.
76	0.0	0.0	174.
77	0.0	0.0	156.
78	0.0	0.0	139.
79	0.0	0.0	125.
80	0.0	0.0	112.
81	0.0	0.0	100.
82	0.0	0.0	90.
83	0.0	0.0	80.
84	0.0	0.0	72.
85	0.0	0.0	65.
86	0.0	0.0	58.
87	0.0	0.0	52.
88	0.0	0.0	46.
89	0.0	0.0	42.
90	0.0	0.0	37.
91	0.0	0.0	33.
92	0.0	0.0	30.
93	0.0	0.0	27.
94	0.0	0.0	24.
95	0.0	0.0	22.

96	0.0	0.0	19.
97	0.0	0.0	17.
98	0.0	0.0	15.
99	0.0	0.0	14.
100	0.0	0.0	12.
SUM	26.52	22.44	91871.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8137.	6992.	3379.	1272.	91874.
INCHES		11.89	22.98	25.96	26.04
AC-FT		3469.	6705.	7573.	7597.

OVF

STATION 1

INFLOW I , OUTFLOW O AND OBSERVED FLOW *

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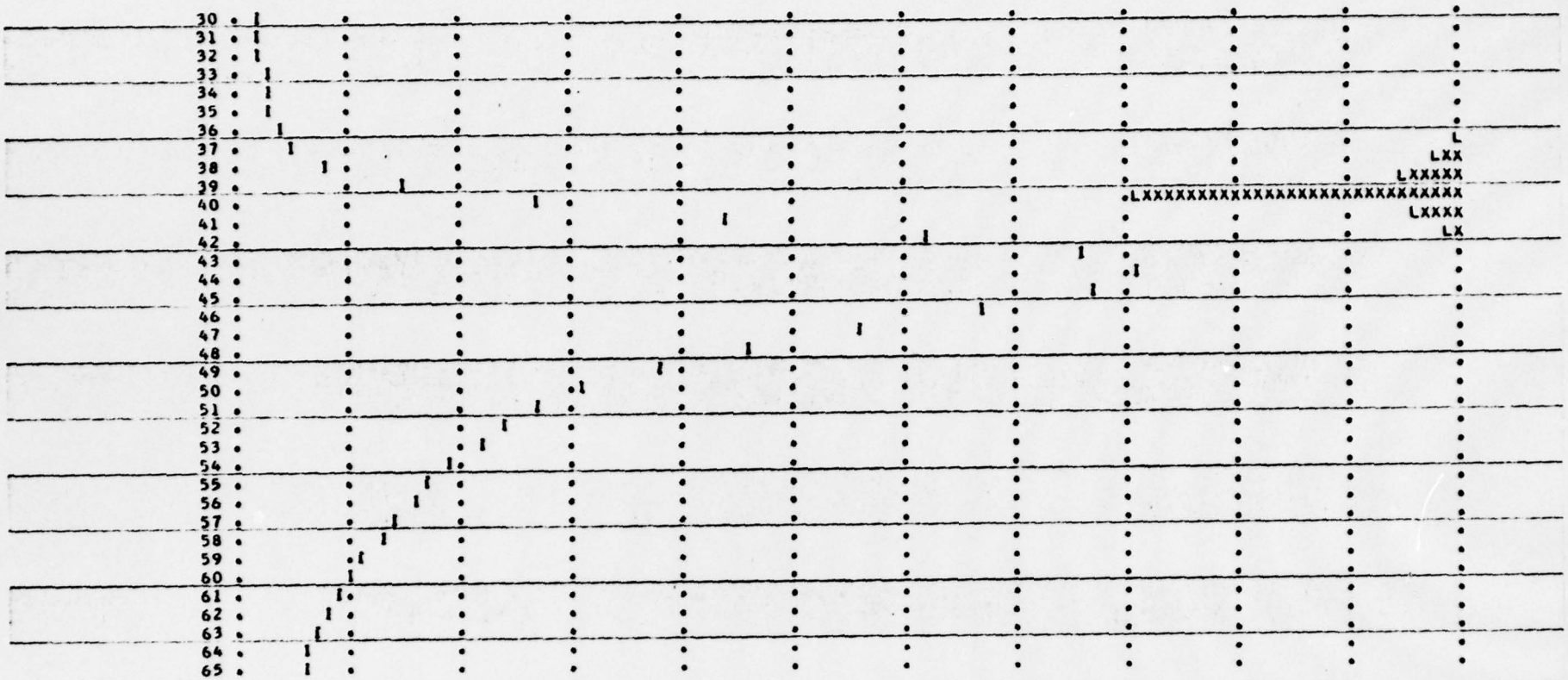
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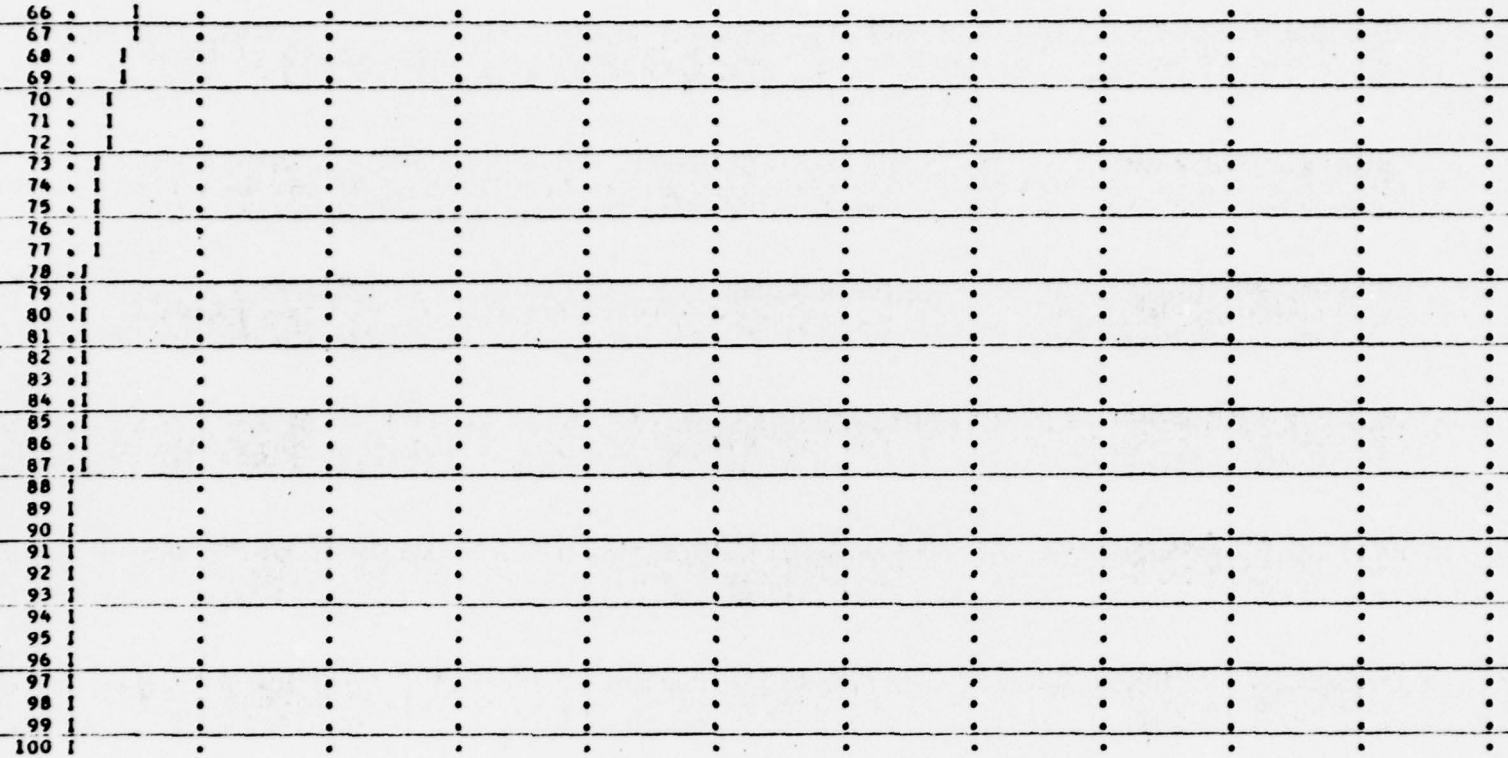
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99 I . . . . . .
100 I . . . . . .

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HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
2	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE	0.	30.	72.	122.	176.	232.	292.	0.	0.	0.
OUTFLOW	0.	337.	952.	1749.	2693.	3763.	4947.	0.	0.	0.

TIME	EOP STOR	AVG IN	EOP OUT
1	0.	5.	5.
2	0.	5.	5.
3	0.	4.	4.
4	0.	4.	4.
5	0.	3.	4.
6	0.	3.	3.
7	0.	3.	3.
8	0.	3.	3.
9	0.	3.	3.
10	0.	2.	2.
11	0.	2.	2.
12	0.	2.	2.
13	0.	2.	2.
14	0.	2.	2.
15	0.	2.	2.
16	0.	3.	3.
17	0.	5.	4.

18	1.	14.	10.
19	2.	29.	22.
20	3.	49.	39.
21	5.	64.	55.
22	6.	70.	64.
23	6.	65.	65.
24	5.	54.	58.
25	4.	45.	50.
26	4.	44.	47.
27	5.	55.	52.
28	6.	77.	68.
29	8.	106.	92.
30	11.	136.	120.
31	13.	164.	147.
32	16.	193.	176.
33	19.	230.	210.
34	22.	275.	251.
35	26.	324.	297.
36	31.	372.	346.
37	36.	450.	424.
38	48.	668.	608.
39	76.	1153.	1022.
40	128.	2068.	1858.
41	207.	3519.	3280.
42	299.	5295.	5081.
43	382.	6908.	6722.
44	434.	7870.	7754.
45	442.	7923.	7906.
46	410.	7203.	7274.
47	359.	6145.	6260.
48	306.	5099.	5217.
49	260.	4206.	4309.
50	221.	3473.	3562.
51	192.	2924.	2999.
52	172.	2566.	2621.
53	156.	2299.	2351.

54	142.	2060.	2107.
55	130.	1846.	1888.
56	119.	1654.	1694.
57	108.	1482.	1525.
58	98.	1327.	1368.
59	89.	1189.	1226.
60	81.	1066.	1099.
61	74.	955.	984.
62	67.	855.	885.
63	61.	766.	796.
64	56.	687.	713.
65	51.	615.	639.
66	46.	551.	573.
67	42.	494.	513.
68	38.	442.	460.
69	35.	396.	412.
70	32.	355.	369.
71	30.	318.	332.
72	27.	285.	302.
73	24.	255.	273.
74	22.	229.	245.
75	20.	205.	220.
76	18.	184.	197.
77	16.	165.	176.
78	14.	147.	158.
79	13.	132.	142.
80	11.	118.	127.
81	10.	106.	114.
82	9.	95.	102.
83	8.	85.	91.
84	7.	76.	82.
85	7.	68.	73.
86	6.	61.	66.
87	5.	55.	59.
88	5.	49.	53.
89	4.	44.	47.

90	4.	39.	42.	
91	3.	35.	38.	
92	3.	32.	34.	
93	3.	28.	30.	
94	2.	25.	27.	
95	2.	23.	24.	
96	2.	20.	22.	
97	2.	18.	20.	
98	2.	16.	18.	
99	1.	15.	16.	
100	1.	13.	14.	
SUM			91865.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7906.	6855.	3375.	1272.	91865.
INCHES		11.66	22.96	25.95	26.04
AC-FT		3401.	6697.	7572.	7596.

OVF

STATION 2

INFLOW I , OUTFLOW O AND OBSERVED FLOW *

```
0.      1000.     2000.     3000.     4000.     5000.     6000.     7000.     8000.      0.        0.        0.
  1 I
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  3 I
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 15 I
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 17 I
 18 I
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 22 .I
 23 .I
 24 .I
 25 IO
 26 I
 27 .I
 28 .I
 29 .I
 30 .I
 31 .OI
```

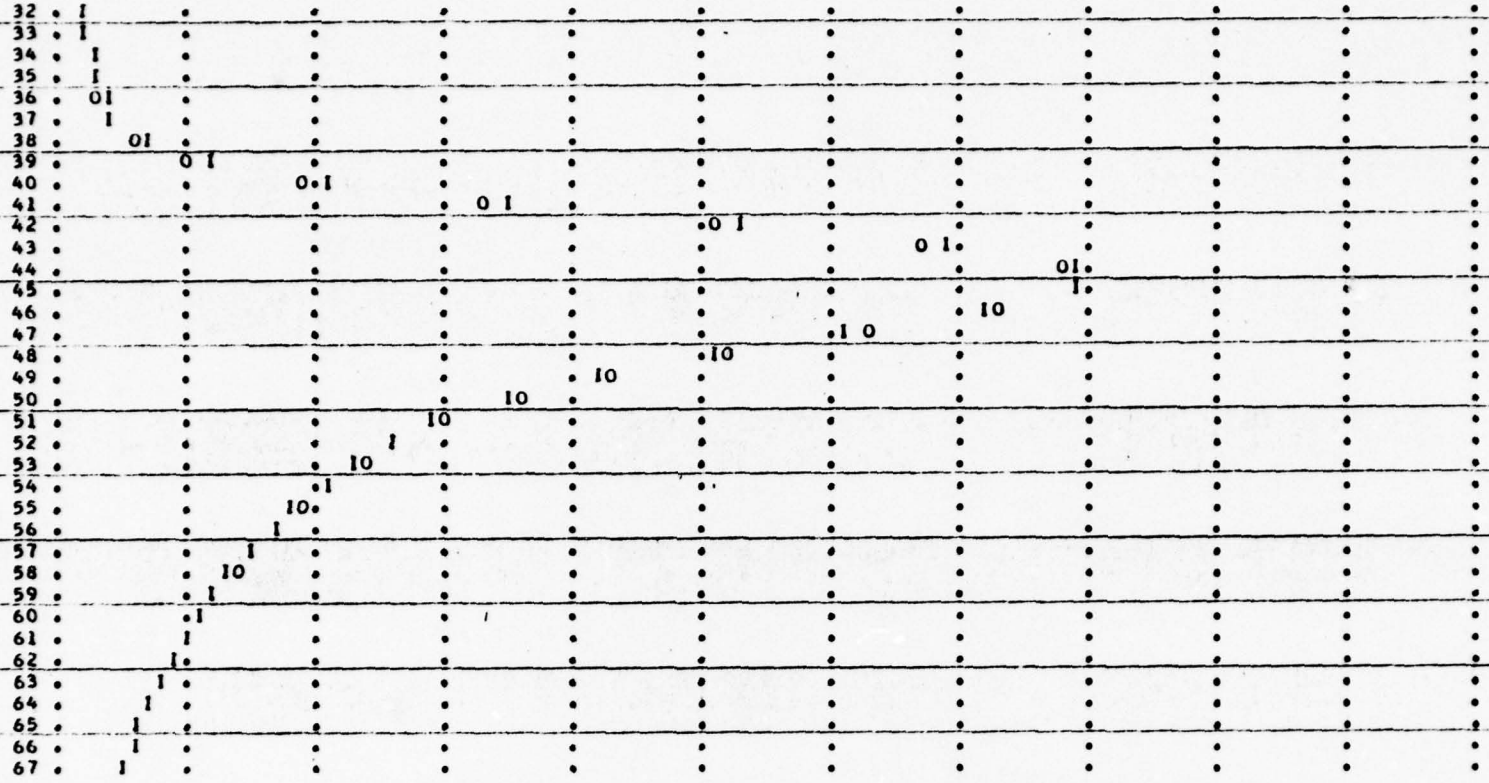
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38 01
39 0 1
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47 1 0
48 10
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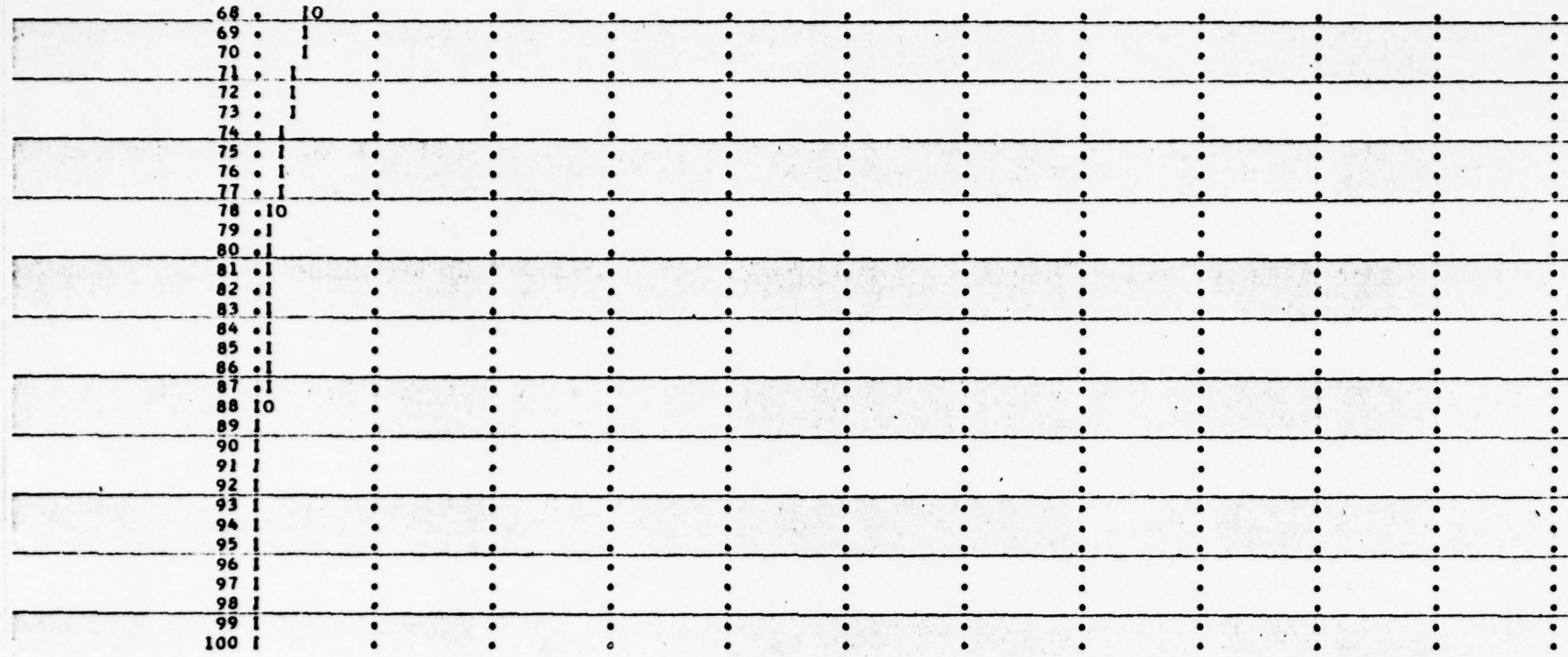
68 10
69 1
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90 1
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92 1
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RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	8137.	6992.	3379.	1272.	5.47
ROUTED TO	2	7906.	6855.	3375.	1272.	5.47

APPENDIX C

PHOTOGRAPHS

PHOTOGRAPH INDEX

1. Upstream face of the crib section. Note: Hole in center through which water is flowing and undulation and deterioration of crest planking. Also, note fill and sediment against structure.

2. Center crib section through which all water is flowing. Note: missing cross tie and rock.

3. Right abutment of crib section.

4. View of embankment section from downstream. Two utility poles and high grass on embankment.

5. Embankment section from upstream.

6. Looking upstream along railroad dividing impoundment and dam.

7. Looking downstream toward Andover from top of dam.

Photo 1

Photo 2

Photo 3

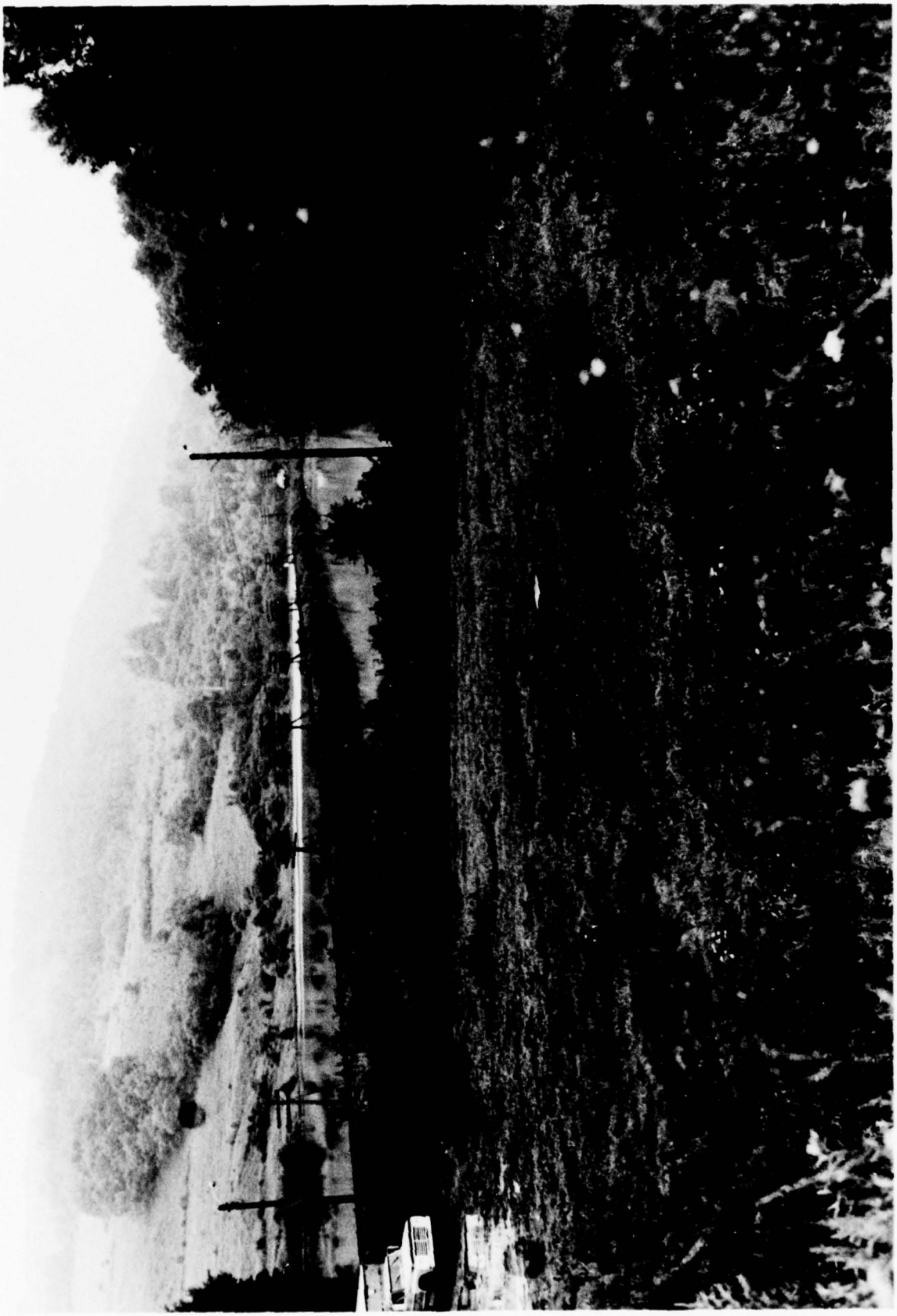


Photo 4

Photo 5

Photo 6

Photo 7

APPENDIX D

PERTINENT CORRESPONDENCE AND REPORTS

TOWN OF ANDOVER

The Town Board

ANDOVER, NY 14806

Aug. 25, 1978

L. Robert Kimball, Associates.
Ebensburg Pa.

Gentlemen;

In refering to your letter of Aug. 16, 1987. I have been able to get the following data on the Dam at the Andover Pond;

It was orginally constructed around 1851 as a source of Power for a saw mill and feed mill located a short distance below. It was of earthen construction and two or three times it was repaired.

In 1951 it was reconstructed and treated timber and rock were used for its construction.

The Andover Rod + Gun Club acquired the right to the area around the Dam and after a thorough survey they felt that the expense of reconstruction was beyond their means. It was then that the Rod & Gun Club decided to transfer the title to the Town of Andover.

Around the turn of the century it was used extensively for recreation Purposes.

The present Dam withstood the ravages of "Agnes" in 1972 very well.

The people of Andover feel that this impoundment is necessary as an auxiliary supply of water for

sure

more

TOWN OF ANDOVER
The Town Board
ANDOVER, NY 14806

fire protection for the Community as well as a potential recreational area.

Trusting this information is of use to you and looking forward to meeting with you on Aug. 31, I remain

Yours Truly.

Howard Burdick, Supt.
Town of Andover

TOWN OF ANDOVER, NEW YORK

The Town Board

ANDOVER, NEW YORK

July 29, 1977

N.Y. State
Dept of Environmental Conservation.

38-1777 [illegible]
Gen.

'77 AUG 2 PM 1 10

Gentlemen:

In regard to the state of condition of the Dam on Lilly Brook, Town of Andover. I would advise you that it has been reviewed by the Allegany County Planning Board and an application has been signed by me to have the dam [illegible].

I have been assured that engineering and designing will be done this year and the actual reconstructing will be done in 1978.

Trusting that this arrangement meets your requirements, I remain.

Howard Burdick, Supr.
Town of Andover.

July 25, 1977

Town Supervisor
Town of Andover
Andover, NY 14806

RE: Dam #38 - 1777
Genesee Watershed

Dear Sir:

In accordance with the Department's Dam Inspection Program, an inspection of the Town's dam on Liberty Brook was made on June 21, 1977.

The structure was found to be in disrepair. Crib stones have been displaced, the apron needs work, and the upstream planking is deteriorating and leaking.

Seeing that failure of the dam could cause serious damage downstream, this office recommends that the town either repair the structure or consider lowering the impoundment.

Please inform this office as to your intentions regarding the above within 30 days.

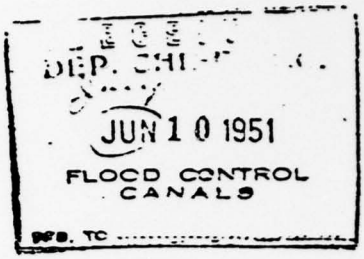
Sincerely,

Kenneth Harmer
Dam Inspector

cc: R. Abendschein

Form E-61. 6-1-49-500 (9D-116)
Ord. 7-43-9

STATE OF NEW YORK



DEPARTMENT OF PUBLIC WORKS

ALBANY

Received July 10, 1951 Dam No. 38 - 1521

Disposition Approved July 17, 1951 Watershed Genesee River

Foundation inspected

Structure inspected

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see third page of this application) for the approval of specifications and detailed drawings, marked

herewith submitted for the {construction / reconstruction} of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about

(Date)

1. The dam will be on flowing into in the town of County of and
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. Location of dam is shown on the quadrangle of the United States Geological Survey.

3. The name of the owner is

4. The address of the owner is

5. The dam will be used for

6. Will any part of the dam be built upon or its pond flood any State lands? No

7. The watershed above the proposed dam is 5.46 ✓ square miles.

8. The proposed dam will create a pond area at the spillcrest elevation of 24.67 ✓ acres and will impound 3,200,000 cubic feet of water.

9. The maximum height of the proposed dam above the bed of the stream is 12 feet 8 inches.

10. The lowest part of the natural shore of the pond is 5 feet vertically above the spillcrest, and everywhere else the shore will be at least 5 feet above the spillcrest.

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam No

12. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) Clay

13. Facing downstream, what is the nature of material composing the right bank? Clay - shale

14. Facing downstream, what is the nature of the material composing the left bank? Clay

R.R. Embankment

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing effect of exposure to air and to water, uniformity, etc Riprap and armoring will be used

16. Are there any porous seams or fissures beneath the foundation of the proposed dam? No

17. WASTES. The spillway of the above proposed dam will be 110' - 0" feet long in the clear; the waters will be held at the right end by a log crib the top of which will be 4.5 feet above the spillcrest, and have a top width of 12' feet; and at the left end by a log crib the top of which will be 4.5 feet above the spillcrest, and have a top width of 12' feet.

18. The spillway is designed to safely discharge 1500 cubic feet per second.

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows:

None

20. What is the maximum height of flash boards which will used on this dam? None

21. APRON. Below the proposed dam there will be an apron built of log crib and stone 20' feet long across the stream, 114' feet wide and 2' feet thick.

22. Does this dam constitute any part of a public water supply? No

INSTRUCTIONS

Read carefully on the third page of this application the law setting forth the requirements to be complied with in order to construct or reconstruct a dam.

Each application for the construction or reconstruction of a dam must be made on this standard form, copies of which will be furnished upon request to the Department of Public Works, Albany, N. Y. The application must be accompanied by three sets of plans, and specifications. The information furnished must be in sufficient detail in order that the stability and safety of the dam can be determined. In cases of large and important dams assumptions made in calculating stresses and stability should be given.

Samples of materials to be used in the dam and of the material on which the dam is to be founded may be asked for, but need not be furnished unless requested.

If the dam constitutes a part of a public water supply, application should be made to the Water Power and Control Commission under Article XI of the Conservation Law.

An application for the construction or reconstruction of a dam must be signed by the prospective owner of the dam or his duly authorized agent. The address of the signer and the date must be given as provided for on the last page of the application form.

SECTION 948 OF THE CONSERVATION LAW

§ 948. Structures for impounding water; inspection of docks; penalties. No structure for impounding water and no dock, pier, wharf or other structure used as a landing place on waters shall be erected or reconstructed by any public authority or by any private person or corporation without notice to the superintendent of public works, nor shall any such structure be erected, reconstructed or maintained without complying with such conditions as the superintendent of public works may by order prescribe for safeguarding life or property against danger therefrom. No order made by the superintendent of public works shall be deemed to authorize any invasion of any property rights, public or private, by any person in carrying out the requirements of such order. The superintendent of public works shall have power, whenever in his judgment public safety shall so require, to make and serve an order, setting forth therein his findings of fact and his conclusions therefrom, directing any person, corporation, officer or board, constructing, maintaining or using any structure hereinbefore referred to, either remove the said structure or to repair or reconstruct the same within such reasonable time and in such manner as shall be specified in such order, and it shall be the duty of every such person, corporation, officer or board, to obey, observe and comply with such order and with the conditions prescribed by the superintendent of public works for safeguarding life or property against danger therefrom, and every person, corporation, officer or board failing, omitting or neglecting so to do, or who hereafter erects or reconstructs any such structure hereinbefore referred to without submitting to the superintendent of public works and obtaining his approval of plans and specifications for such structures when required so to do by his order or hereafter fails to remove, erect or to reconstruct the same in accordance with the plans and specifications so approved shall forfeit to the people of this State a sum not to exceed five hundred dollars to be fixed by the court for each and every offense; every violation of any such order shall be a separate and distinct offense, and, in such case of a continuing violation, every day's continuance thereof shall be and be deemed to be a separate and distinct offense. Such order shall not contain any provision to compel the owner to make repairs or proceed with reconstruction as specified in this section by any type of construction other than that of the dam itself. In addition to said forfeiture upon the violation of any such order, the superintendent of public works shall have power to enter upon the lands and waters where such structures are located, for the purpose of removing, repairing or reconstructing the same, and to take such other and further precautions which he may deem necessary to safeguard life or property against danger therefrom. In removing, repairing and reconstructing such dam the superintendent shall not deviate from the method, manner or specifications contained in the original order. The superintendent of public works shall certify the amount of the costs and expenses incurred by him for the removal, repair or reconstruction aforesaid, or in anywise connected therewith, to the board of supervisors of the county or counties in which the said lands and waters are located, whereupon it shall be the duty of such board of supervisors to add the amount so certified to the assessment rolls of such locality or localities as a charge against the real property upon which the dam is located designated or described by the superintendent of public works as chargeable therewith, and to issue its warrant or warrants for the collection thereof. Thereupon it shall become the duty of such locality or localities through their proper officers to collect the amount so certified in the same manner as other taxes are collected in such locality or localities, and when collected to pay the same

to the superintendent of public works who shall thereupon pay the same into the state treasury. Any amount so levied shall thereupon become and be a lien upon the real property affected thereby, to the same extent as any tax levy becomes and is a lien thereon.

Any person in interest may, within thirty days from the service of any such order, appeal to the supreme court to determine the reasonableness of such order. At any time during such appeal to the supreme court upon at least three days' notice, the party appealing may apply for an order directing any question of fact to be tried and determined by a jury, and the court shall thereupon cause such question to be stated for trial accordingly and the findings of the jury upon such question shall be conclusive. Appeals may be taken from the supreme court to the appellate division of the supreme court and to the court of appeals in such cases, subject to the limitations provided in the civil practice act.

This section shall not apply to a dam where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than ten feet in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons; nor to a dock, pier, wharf or other structure under the jurisdiction of the department of docks, if any, in a city of over one hundred and seventy-five thousand population. This section as hereby amended shall not impair the effect of an order heretofore made by the conservation commission or commissioner under this section prior to the taking effect of chapter four hundred and ninety-nine of the laws of nineteen hundred and twenty-one, nor require the approval by the superintendent of public works, of plans and specifications theretofore approved by such commission or comissioner under this section.

The foregoing information is correct to the best of my knowledge and belief, and the construction will be carried out in accordance with the approved plans and specifications.

Town of Andover, Owner

By Reginald Rathbun Jr., authorized agent of owner.

Address of signer Andover N. Y Date 7/5/51

Form E-41. S-10-51-1M (1D-331)
Ord. 7-45-48

STATE OF NEW YORK

RECEIVED
DEP. CHIEF ENG.
MAR 2 1953
FLOOD CONTROL
CANALS
RFD. TO:

DEPARTMENT OF PUBLIC WORKS

ALBANY

Received Mar. 2, 1953 Dam No. 38-1777 (38-1521. See

Disposition Appv. Apr. 20, 1953 Watershed Genesee

Foundation inspected

Structure inspected

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see third page of this application) for the approval of specifications and detailed drawings, marked Andover Pond & Gun Club Pond

herewith submitted for the { construction / reconstruction } of a dam herein described. All provisions of law will be complied with in the erection of the proposed ~~dam~~. It is intended to complete the work covered by the application about February 4, 1953 (Date)

1. The dam will be on Liberty Brook flowing into Dyke Creek in the town of Andover County of Allegany and within the Village limits--See pond in U.S.G.S. Sheet (Give exact distance and direction from a well-known bridge, dam, village, main cross-roads or mouth of a stream)

2. Location of dam is shown on the Wellsville quadrangle of the United States Geological Survey.

3. The name of the owner is Town of Andover

4. The address of the owner is Andover, New York

5. The dam ~~will be~~ being used for Marsh, Wildlife Area and recreation (Dam 38-1521)

6. Will any part of the dam be built upon or its pond flood any State lands? No

7. The watershed above the proposed dam is 5.46 square miles.

8. The proposed dam will create a pond area at the spillcrest elevation of 24.47 at Spillcrest 35.79 with flashboards acres and will impound 5,127,000 cubic feet of water. with flashboards

9. The maximum height of the ~~proposed~~ present dam above the bed of the stream is 12 feet 3 inches.

10. The lowest part of the natural shore of the pond is 6 feet vertically above the spillcrest, and everywhere else the shore will be at least 8 feet above the spillcrest.

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the ~~proposed~~ present dam No

12. The natural material of the bed on which the ~~proposed~~ present dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) Clay

13. Facing downstream, what is the nature of material composing the right bank? Clay-Shale

14. Facing downstream, what is the nature of the material composing the left bank? Clay-Railroad Embankment.

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. Clay-Log Crib Structure will be used.

16. Are there any porous seams or fissures beneath the foundation of the ~~proposed~~ present dam? No

17. WASTES. The spillway of the above proposed dam will be 113'-7½" feet long in the clear: the waters will be held at the right end by a Log Crib the top of which will be 4.1 feet above the spillcrest, and have a top width of 12 feet; and at the left end by a Log Crib the top of which will be 4.1 feet above the spillcrest, and have a top width of 12 feet.

18. The spillway is designed to safely discharge 1577 cubic feet per second.

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows:

None

20. What is the maximum height of flash boards which will be used on this dam? 1.0'

21. APRON. Below the ~~proposed~~ present dam there will be an apron built of Log Crib and Stone 20 feet long across the stream, 114 feet wide and 3 feet thick.

22. Does this dam constitute any part of a public water supply? No

INSTRUCTIONS

Read carefully on the third page of this application the law setting forth the requirements to be complied with in order to construct or reconstruct a dam.

Each application for the construction or reconstruction of a dam must be made on this standard form, copies of which will be furnished upon request to the Department of Public Works, Albany, N. Y. The application must be accompanied by three sets of plans, and specifications. The information furnished must be in sufficient detail in order that the stability and safety of the dam can be determined. In cases of large and important dams assumptions made in calculating stresses and stability should be given.

Samples of materials to be used in the dam and of the material on which the dam is to be founded may be asked for, but need not be furnished unless requested.

If the dam constitutes a part of a public water supply, application should be made to the Water Power and Control Commission under Article XI of the Conservation Law.

An application for the construction or reconstruction of a dam must be signed by the prospective owner of the dam or his duly authorized agent. The address of the signer and the date must be given as provided for on the last page of the application form.

SECTION 948 OF THE CONSERVATION LAW

§ 948. Structures for impounding water; inspection of docks; penalties. No structure for impounding water and no dock, pier, wharf or other structure used as a landing place on waters shall be erected or reconstructed by any public authority or by any private person or corporation without notice to the superintendent of public works, nor shall any such structure be erected, reconstructed or maintained without complying with such conditions as the superintendent of public works may by order prescribe for safeguarding life or property against danger therefrom. No order made by the superintendent of public works shall be deemed to authorize any invasion of any property rights, public or private, by any person in carrying out the requirements of such order. The superintendent of public works shall have power, whenever in his judgment public safety shall so require, to make and serve an order, setting forth therein his findings of fact and his conclusions therefrom, directing any person, corporation, officer or board, constructing, maintaining or using any structure hereinbefore referred to, either remove the said structure or to repair or reconstruct the same within such reasonable time and in such manner as shall be specified in such order, and it shall be the duty of every such person, corporation, officer or board, to obey, observe and comply with such order and with the conditions prescribed by the superintendent of public works for safeguarding life or property against danger therefrom, and every person, corporation, officer or board failing, omitting or neglecting so to do, or who hereafter erects or reconstructs any such structure hereinbefore referred to without submitting to the superintendent of public works and obtaining his approval of plans and specifications for such structures when required so to do by his order or hereafter fails to remove, erect or to reconstruct the same in accordance with the plans and specifications so approved shall forfeit to the people of this State a sum not to exceed five hundred dollars to be fixed by the court for each and every offense; every violation of any such order shall be a separate and distinct offense, and, in such case of a continuing violation, every day's continuance thereof shall be and be deemed to be a separate and distinct offense. Such order shall not contain any provision to compel the owner to make repairs or proceed with reconstruction as specified in this section by any type of construction other than that of the dam itself. In addition to said forfeiture upon the violation of any such order, the superintendent of public works shall have power to enter upon the lands and waters where such structures are located, for the purpose of removing, repairing or reconstructing the same, and to take such other and further precautions which he may deem necessary to safeguard life or property against danger therefrom. In removing, repairing and reconstructing such dam the superintendent shall not deviate from the method, manner or specifications contained in the original order. The superintendent of public works shall certify the amount of the costs and expenses incurred by him for the removal, repair or reconstruction aforesaid, or in anywise connected therewith, to the board of supervisors of the county or counties in which the said lands and waters are located, whereupon it shall be the duty of such board of supervisors to add the amount so certified to the assessment rolls of such locality or localities as a charge against the real property upon which the dam is located designated or described by the superintendent of public works as chargeable therewith, and to issue its warrant or warrants for the collection thereof. Thereupon it shall become the duty of such locality or localities through their proper officers to collect the amount so certified in the same manner as other taxes are collected in such locality or localities, and when collected to pay the same to the superintendent of public works who shall thereupon pay the same into the state treasury. Any amount so

levied shall thereupon become and be a lien upon the real property affected thereby, to the same extent as any tax levy becomes and is a lien thereon.

Any person in interest may, within thirty days from the service of any such order, appeal to the supreme court to determine the reasonableness of such order. At any time during such appeal to the supreme court upon at least three days' notice, the party appealing may apply for an order directing any question of fact to be tried and determined by a jury, and the court shall thereupon cause such question to be stated for trial accordingly and the findings of the jury upon such question shall be conclusive. Appeals may be taken from the supreme court to the appellate division of the supreme court and to the court of appeals in such cases, subject to the limitations provided in the civil practice act.

This section shall not apply to a dam where the area draining into the pond formed thereby does not exceed one square mile, unless the dam is more than ten feet in height above the natural bed of the stream at any point or unless the quantity of water which the dam impounds exceeds one million gallons; nor to a dock, pier, wharf or other structure under the jurisdiction of the department of docks, if any, in a city of over one hundred and seventy-five thousand population. This section as hereby amended shall not impair the effect of an order heretofore made by the conservation commission or commissioner under this section prior to the taking effect of chapter four hundred and ninety-nine of the laws of nineteen hundred and twenty-one, nor require the approval by the superintendent of public works, of plans and specifications theretofore approved by such commission or commissioner under this section.

The foregoing information is correct to the best of my knowledge and belief, and the construction will be carried out in accordance with the approved plans and specifications.

By Reynold Hoolheran, Supervisor

Town of Andover, Owner

By _____, authorized agent of owner.

Address of signer Andover, N.Y. Date 2/12/53

ANDOVER POND

Surface Areas

		Totals
Elev.	1670	54.76 Ac.
	1669	51.57 Ac.
	1668	48.61 Ac.
	1667	35.79 Ac.
	1666	24.47 Ac.
	1665	18.97 Ac.
	1664	14.10 Ac.

Proposed water elevation 1666.0

Proposed maximum water elevation 1669.0

50 Yr. Rainfall (Yarnell)

Infiltration

.098 x 8 = 0.784

5 Min.	.55
10 Min.	1.00
15 Min.	1.28
30 Min.	1.95
60 Min.	2.50
120 Min.	3.20
240 Min.	3.50
480 Min.	3.90

Maximum Flood

$$R = \frac{(1-F) \text{ Max} \times 3500}{12}$$

$$R = \frac{3.10 \times 3500}{12} \quad 904.17 \text{ feet}$$

T. = 130 Min.
I. = 1.56 Min.

Q = 0.306 x 1.56 x 3500 = 1681.68 = 1682.0 C.F.S.

V = R x 0.000842

904.2 x 0.000842 = 0.761 acre feet

$$W = \frac{1682}{60} = 28.0 \quad \text{lineal unit of flow in C.F.S.}$$

$$K = 726 \frac{V}{W} \cdot 726 \times \frac{0.761}{28} = 19.73$$

DISTRIBUTION GRAPH				DESIGN INFLOW HYDROGRAPH		
Point	Coordinates		Cumulative Runoff in % of Total	Coordinates Time in Min. KT	Flow in C.F.S. KQ	Cumulative Runoff in Acre Feet
	T	Q				
A	0	0	0	0	0	
B	2	3.5	0.3	39.46	98.0	2.7
C	4	8.6	1.3	78.92	240.8	11.75
D	6	20.7	3.8	118.38	579.6	34.4
E	8	35.0	8.5	157.84	980.0	76.8
F	10	49.7	15.6	197.30	1391.6	141.0
G	12	58.5	24.7	236.76	1658.0	223.3
H	14	60.0	34.8	276.22	1680.0	314.6
I	16	57.7	44.6	315.68	1615.6	403.3
J	18	51.0	53.8	357.14	1428.0	486.4
K	20	43.8	61.8	394.60	1226.4	558.8
L	24	30.0	74.2	473.52	840.0	671.9
M	28	20.4	82.7	552.44	571.2	747.7
N	32	14.0	88.4	631.36	392.0	799.3
O	36	9.6	92.4	710.28	268.8	835.5
P	40	6.6	95.2	789.20	184.8	860.8
Q	50	2.4	98.9	986.50	67.2	894.25
R	60	0	100.0	1183.20	0	904.2

Q = CLH 3/2

H = 1.0'

Q = 3.3 x 95.0 x 1 3/2

Q = 315.5 C.F.S.

Q = CLH 3/2

H = 2.0'

Q = 3.3 x 95.0Y 2 3/2

Q = 886.6

Q = CLH 3/2

H = 3.0'

Q = 3.3 x 95.0 x 3 3/2

Q = 1629.3

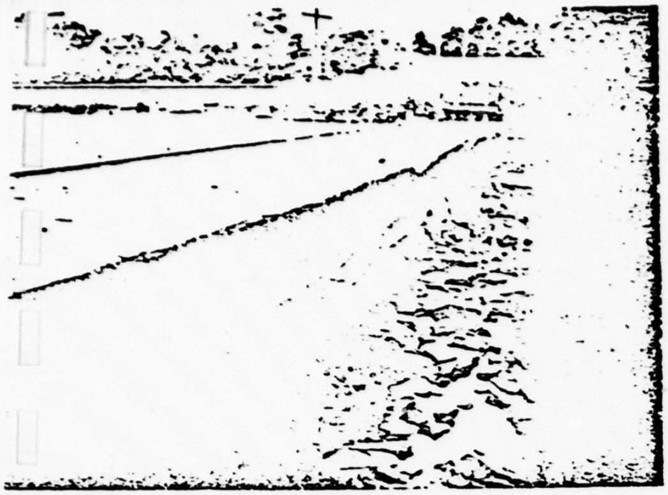
ANDOVER POND WATERSHED

3500 Acres

Pond (Lat. 42-10-00)
(Long. 77-47-30) Wellsville Quadrangle

Woods--	5-15%	--Volusia	200 Ac.
	5-15%	-- Lordstown	120 Ac.
	5-15%	--Wardin	82 Ac.
	15-30%	--Volusia	716 Ac.
	15-30%	--Lordstown	557 Ac.
			1625
Pasture--	5-15%	--Wooster	10 Ac.
	5-15%	--Volusia	556 Ac.
	5-15%	--Wardin	50 Ac.
	5-15%	--Lordstown	30 Ac.
	15-30%	--Volusia	271 Ac.
	15-30%	--Lordstown	336 Ac.
			1253
Cropland--	5-15%	--Bath	82 Ac.
	5-15%	--Wardin	20 Ac.
	5-15%	--Volusia	313 Ac.
	5-15%	--Lordstown	50 Ac.
	0-5%	--Muck	10 Ac.
			475
Marsh	0-5%	--Muck	40 Ac.
	0-5%	--Middlebury	107 Ac.
			147
			3500 Ac.

Contour Elev.	Area in Acres.	Area	Average Area in Acres	D-in Feet	Volumn in Acre Feet	Cumulative Volumn over Spillway in Acre Feet.
1664.0	14.10					
1665.0	18.97					
1666.0	24.47					
		60.26	30.13	1	30.13	30.13
1667.0	35.79					
		84.40	42.20	1	42.20	72.33
1668.0	48.61					
		100.18	59.09	1	50.09	122.42
1669.0	51.57					
1670.0	54.76					



ENVIRONMENTAL CONSERVATION
TION REPORT
Inspection)

nty	Hazard Class	Date & Inspector
[illegible]	B T	6-21-77 K.D.H

= Town of Ridour

Use

- ☐ Water Supply
- ☐ Power
- ☑ Recreation - ☐ High Density
- ☑ Fish and Wildlife
- ☐ Farm Pond
- ☐ No Apparent Use-Abandoned
- ☐ Flood Control
- ☐ Other ______

- ☐ Stone
- ☑ Timber crib
- ☐ Other ______

Estimated Impoundment Size 24 Ac. Acres Estimated Height of Dam above Streambed 12 Ft.

Condition of Spillway

- ☐ Service satisfactory
- ☑ In need of repair or maintenance
- ☐ Auxiliary satisfactory
- ☐ In need of repair or maintenance

Explain: Need general maintenance

Condition of Non-Overflow Section

- ☑ Satisfactory
- ☐ In need of repair or maintenance

Explain: ______

Condition of Mechanical Equipment

- ☑ Satisfactory ?
- ☐ In need of repair or maintenance

Explain: ______

Siltation ☐ High ☐ Low

Explain: ______

Remarks: ______

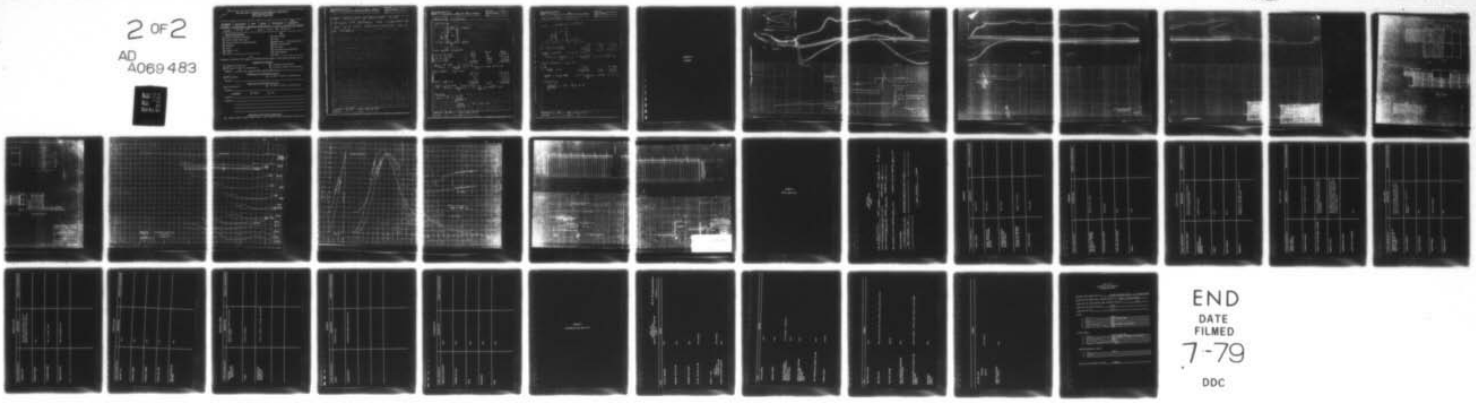
Evaluation (From Visual Inspection)

- ☐ Repairs req'd. beyond normal maint.
- ☐ No defects observed beyond normal maint.

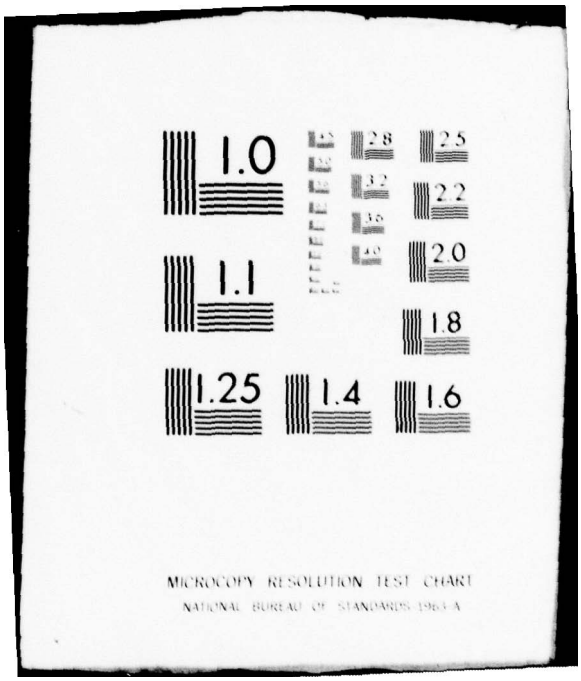
AD-A069 483 KIMBALL (L ROBERT) AND ASSOCIATES EBENSBURG PA F/G 13/2
NATIONAL DAM SAFETY PROGRAM. ANDOVER ROD AND GUN CLUB DAM, (INV--ETC(U)
SEP 78 R J KIMBALL DACW51-78-C-0025

UNCLASSIFIED NL

2 OF 2
AD A069 483



END
DATE FILMED
7-79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DAM INSPECTION REPORT
(By Visual Inspection)

Dam Number	River Basin	Town	County	Hazard Class	Date & Inspector
1777 8-1521	Genesee	Fredonia	Allegany	B T	6-21-77 K.D.F.

Stream = Liberty Bk   Owner = Town of Fredonia

Type of Construction

- [ ] Earth w/Concrete Spillway
- [ ] Earth w/Drop Inlet Pipe
- [ ] Earth w/Stone or Riprap Spillway
- [ ] Concrete
- [ ] Stone
- [x] Timber crib
- [ ] Other ____

Use

- [ ] Water Supply
- [ ] Power
- [x] Recreation - [ ] High Density
- [x] Fish and Wildlife
- [ ] Farm Pond
- [ ] No Apparent Use-Abandoned
- [ ] Flood Control
- [ ] Other ____

Estimated Impoundment Size 24 Ac. Acres Estimated Height of Dam above Streambed 12 Ft.

Condition of Spillway

- [ ] Service satisfactory
- [x] In need of repair or maintenance
- [ ] Auxiliary satisfactory
- [ ] In need of repair or maintenance

Explain: Need general maintenance

Condition of Non-Overflow Section

- [x] Satisfactory
- [ ] In need of repair or maintenance

Explain: ____

Condition of Mechanical Equipment

- [x] Satisfactory ?
- [ ] In need of repair or maintenance

Explain: ____

Siltation [ ] High [ ] Low

Explain: ____

Remarks: ____

Evaluation (From Visual Inspection)

- [ ] Repairs req'd. beyond normal maint.
- [ ] No defects observed beyond normal maint.

Form B. & G. C-7-4-1. [illegible]
Ord. No. CC 163-3-03-38

Subject: [illegible] Rod & Gun Club

Sheet No. 1

Total No. Sheets

Date

For Amount of Run-off and design of Spillway see computation by U.S. Soil Conservation Servi. in folder.

Computed by J. K. Date 7 12, 19[illegible]

Checked by Date

Form B. & G. C-7-A-1. 6-20-10-20M (B-207)
Orig. NC CC 103-3-C3-38.

Subject: Andover Rod & Gun Club

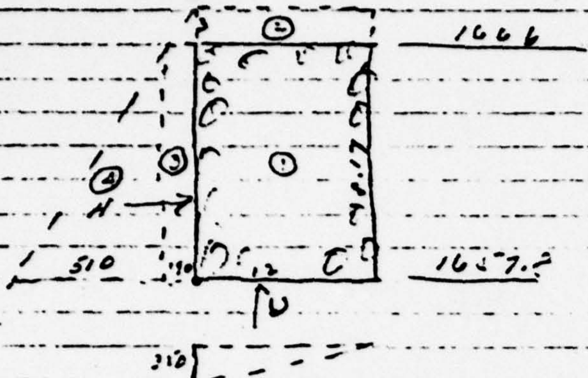
Sheet No. 2

Total No. Sheets

Date

Stability of Dam.

Spillway



High Water - No uplift.

	Wt.	Arm	Mom.
① 8.17 x 12 x 100 =	9800	6	59000
② 3 x 12 x 62.5 =	2250	6	13500
③ 8.17 x 190 x =	—	4.08	6300
④ 255 x 8.17 =	—	2.72	5700
	12050	7.0	84500

$\frac{7}{12} = .58$ OK e = 7 - 6 = 1.0

Press. = $\frac{12050}{12}\left(1 + 6 \times \frac{1}{12}\right)$ = 1500 #/□' ok

High Water - Uplift

	Wt.	Arm	Mom.
①	9800		59000
②	2250		13500
③	—		6300
④	—		5700
⑤ uplift $\frac{350}{2}$ x 12	-2100	+	-8400
	9950	7.65	76100

$\frac{7.65}{12} = .647$ ok e = 7.65 - 6 = 1.65

Press. = $\frac{9950}{12}\left(1 + 6 \times \frac{1.65}{12}\right)$ = 1800 #/□' ok

Sliding

8.17 x 190 = 1550

8.17 x 255 = 2080

3630 #

$\frac{3630}{9950}$ = .365 Say OK

Computed by J. K. Date July 17, 51

Checked by Date

Form [illegible]

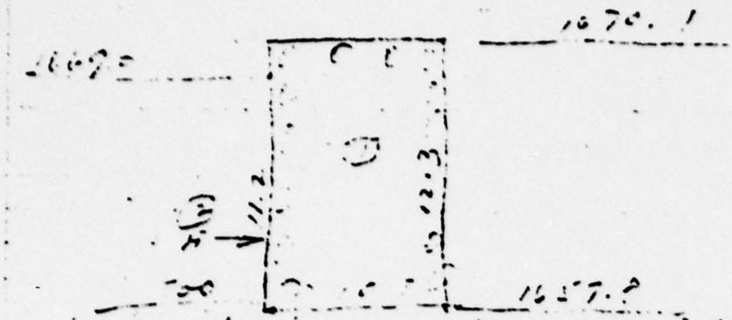
Subject: [illegible]

Sheet No. 2

Total No. Sheets

Date

Non Overflow Section



Low Water - No Uplift

	Wt.	Arm	Mom.
① [illegible] x 10 x 150 =	[illegible]	5	[illegible]
② H 350 x 11.2 = 3900		3.73	[illegible]
	[illegible]	6.15	[illegible]

$\frac{6.15}{10} = .615$ e = 6.15 - 5 = 1.15

Press = $\frac{[illegible]}{10}\left(1 - \frac{6 \times 1.15}{10}\right)$ = [illegible] #/sq ft

High Water - Uplift

① ③

U $\frac{350}{2}$ x 10

	Wt.	Arm	Mom.
	[illegible]	3.33	[illegible]
	- 1750	6.66	- [illegible]
	10 550		[illegible]

$\frac{6.66}{10}$ = .666 O.K.   Press = $\frac{10550}{10}$ = 1055 #/sq ft

Sliding

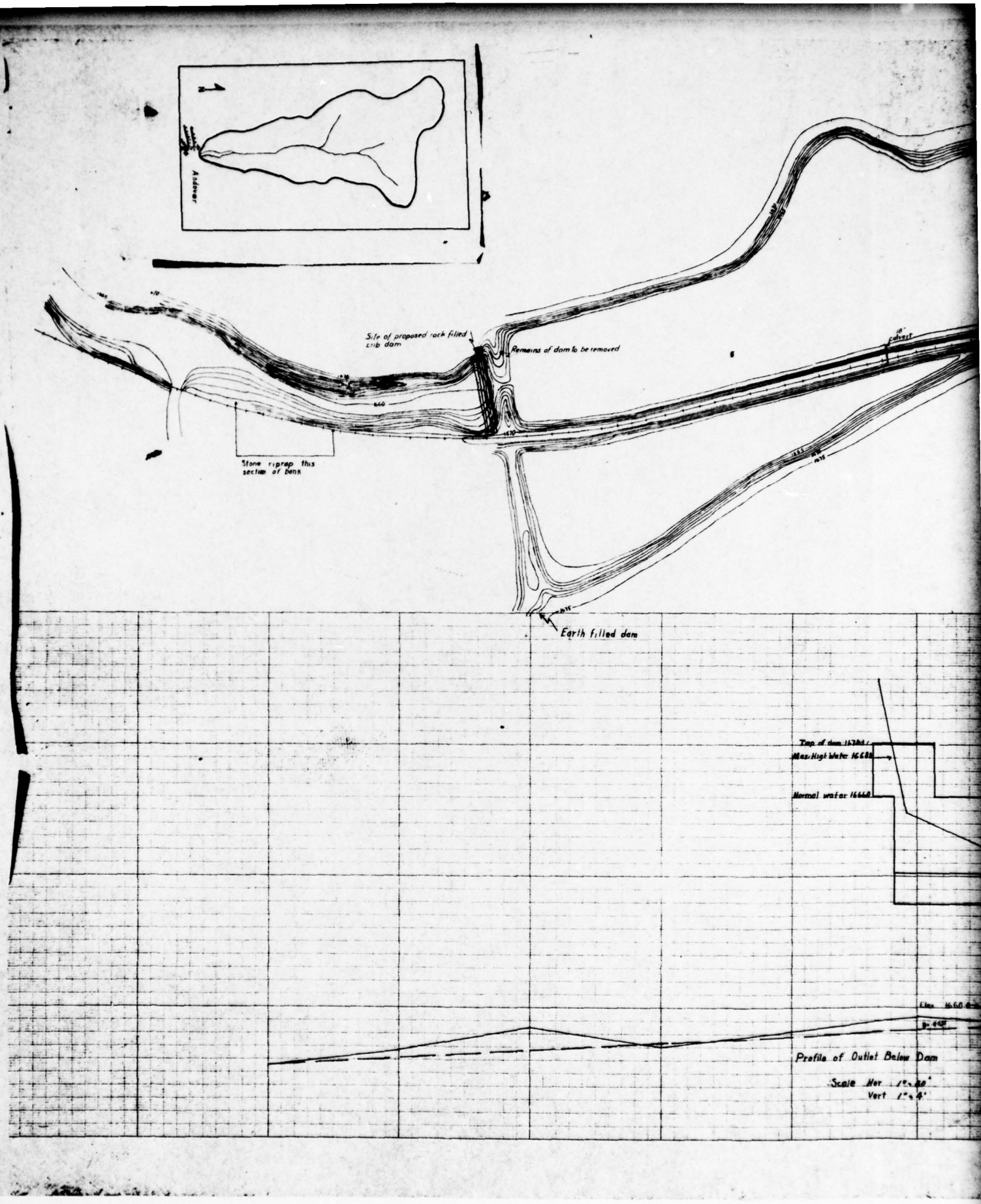
$\frac{3900}{10550}$ = .37 Say O.K.

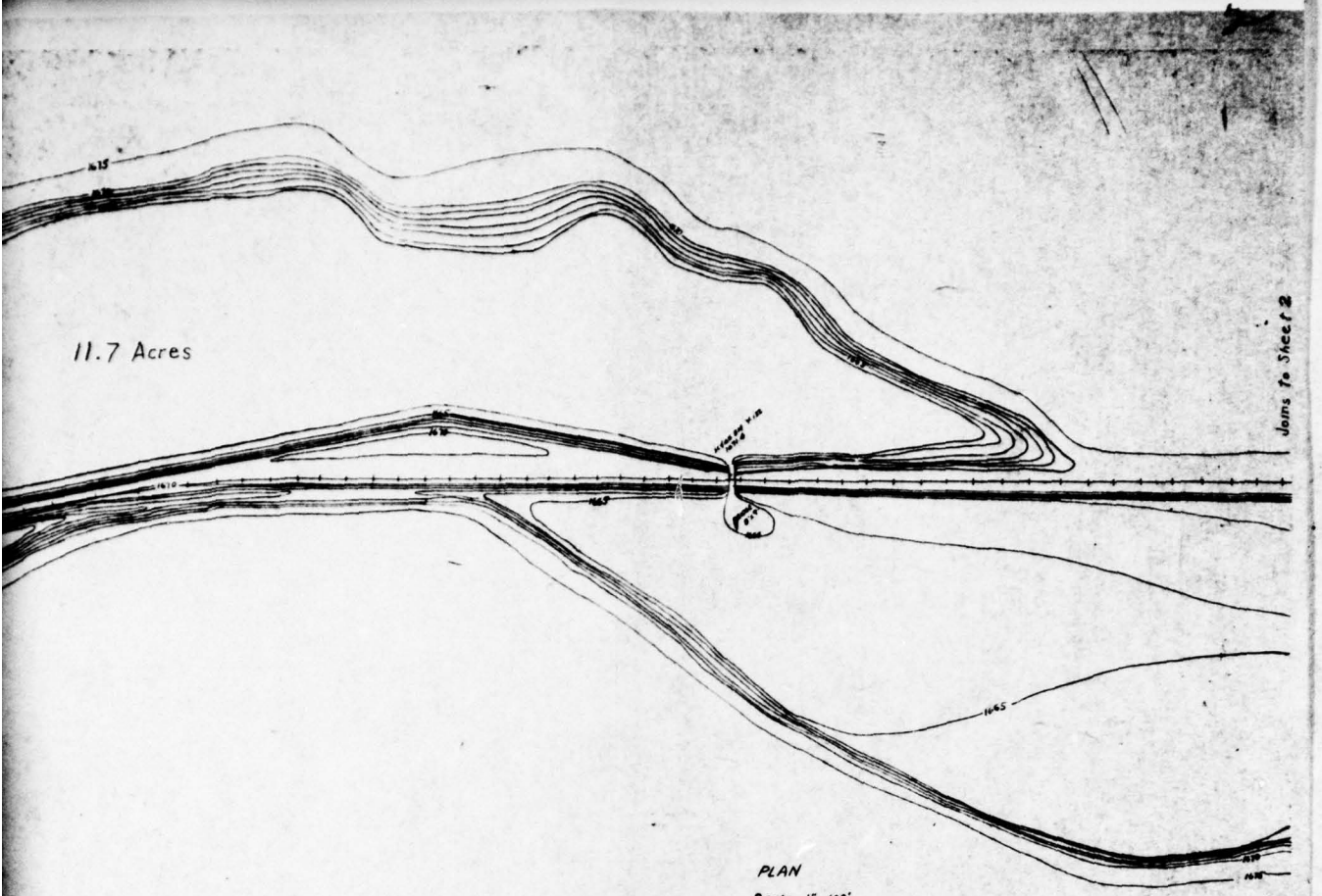
Computed by [illegible] K. Date July 17 1951

Checked by [illegible] Date

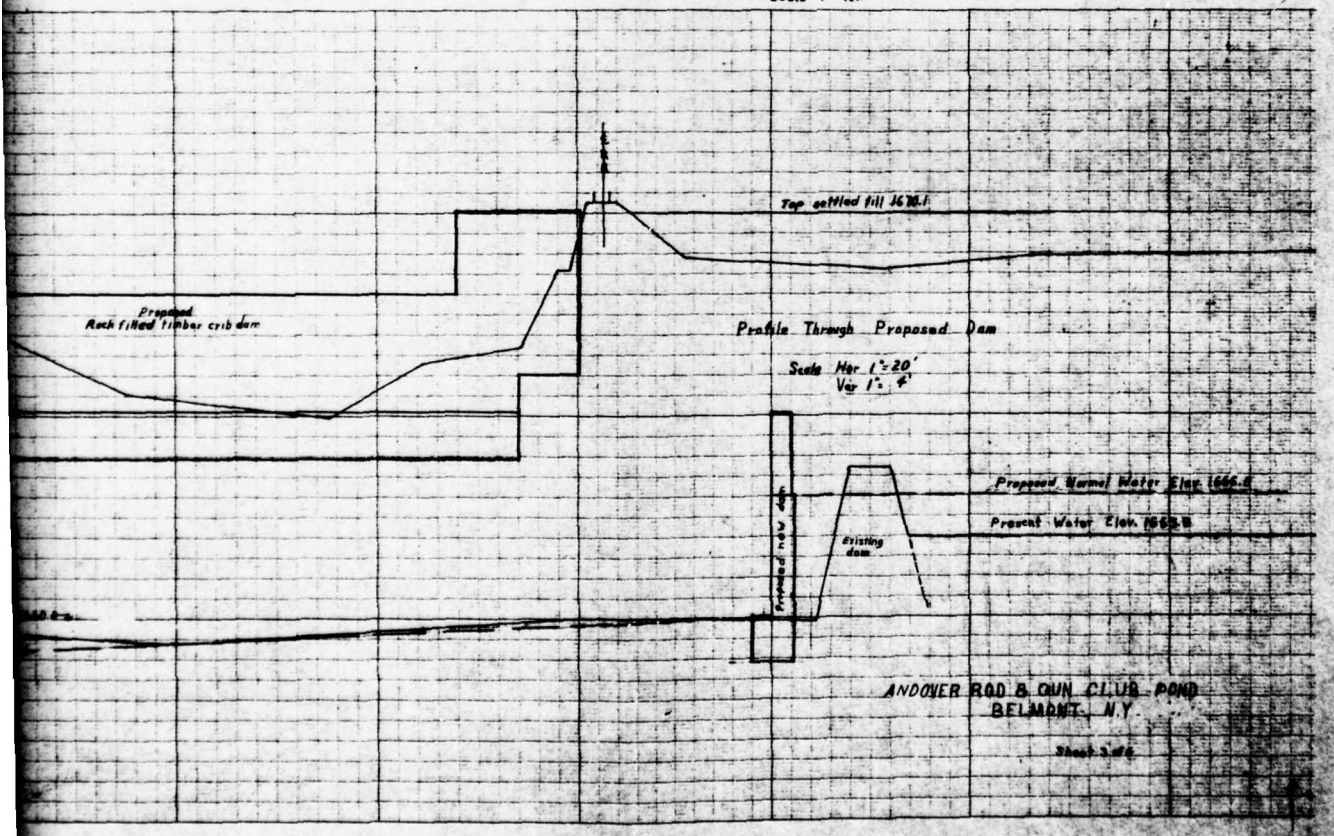
APPENDIX E

DRAWINGS


Andover
Site of proposed rock filled crib dam
Remains of dam to be removed
18" culvert
Stone riprap this section of bank
Earth filled dam
Top of dam 16780
Max. High Water 16688
Normal water 16660
Profile of Outlet Below Dam
Scale Hor 1" = 20'
Vert 1" = 4'

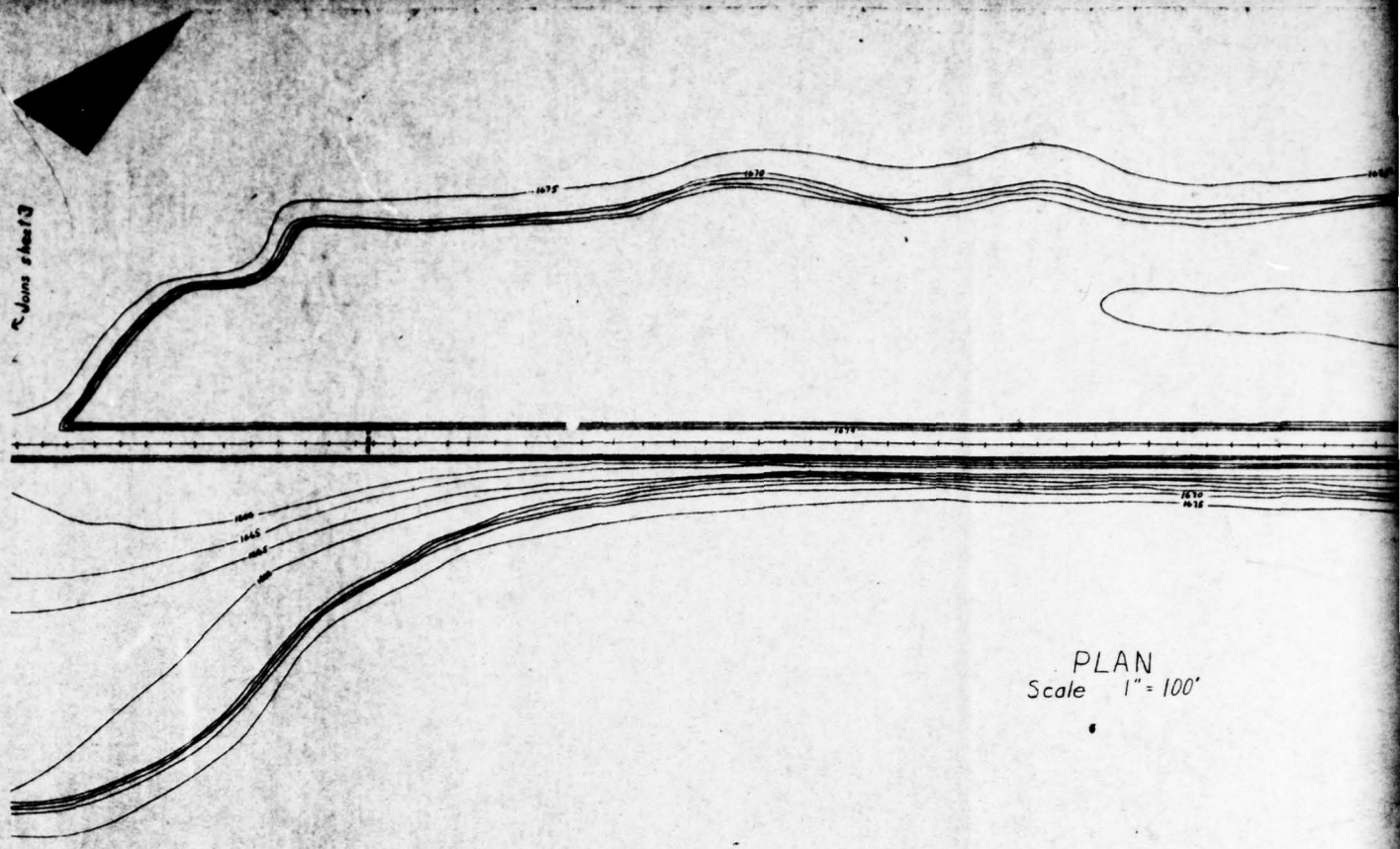


PLAN
Scale 1" = 100'

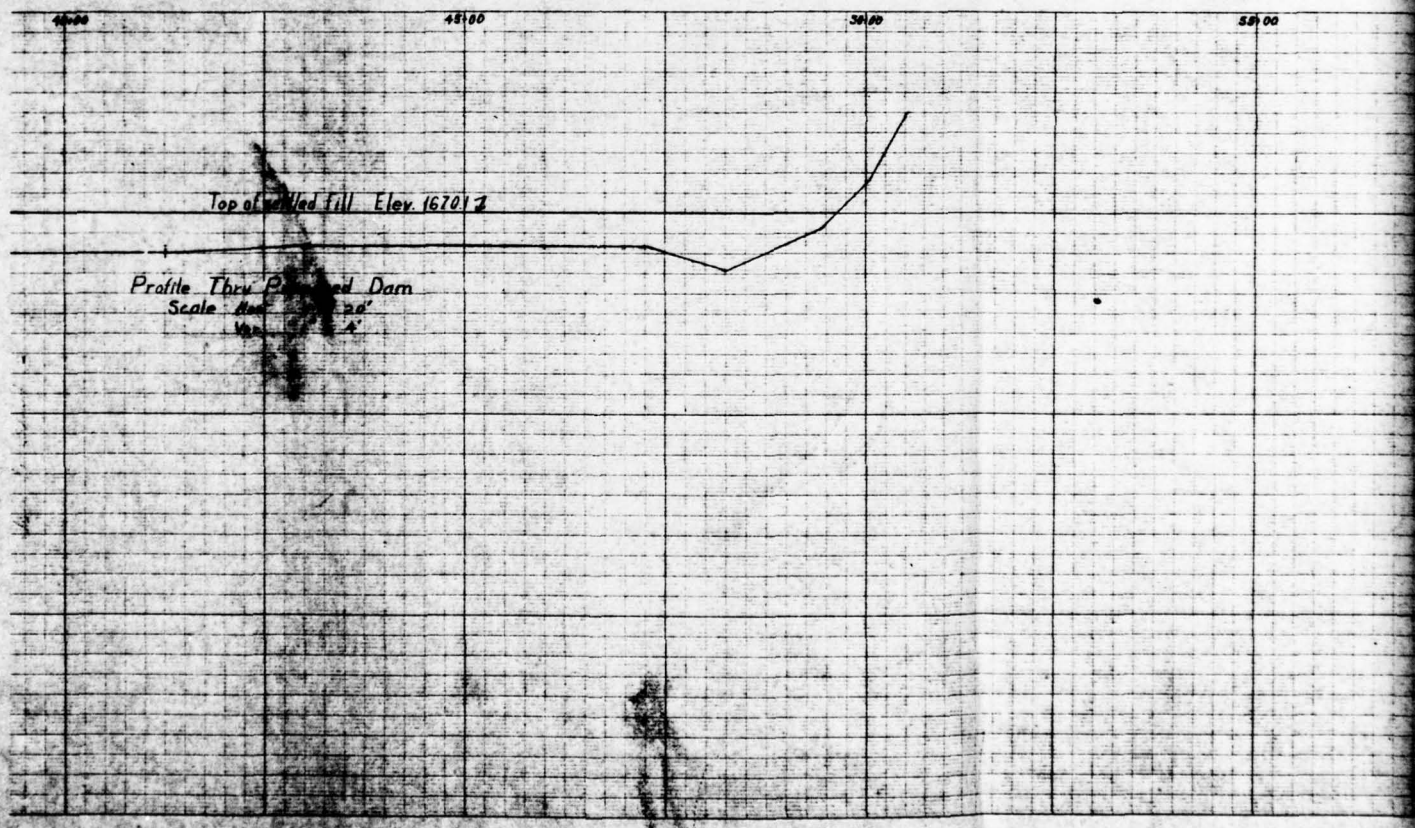


Profile Through Proposed Dam
Scale Hor 1" = 20'
Ver 1" = 4'

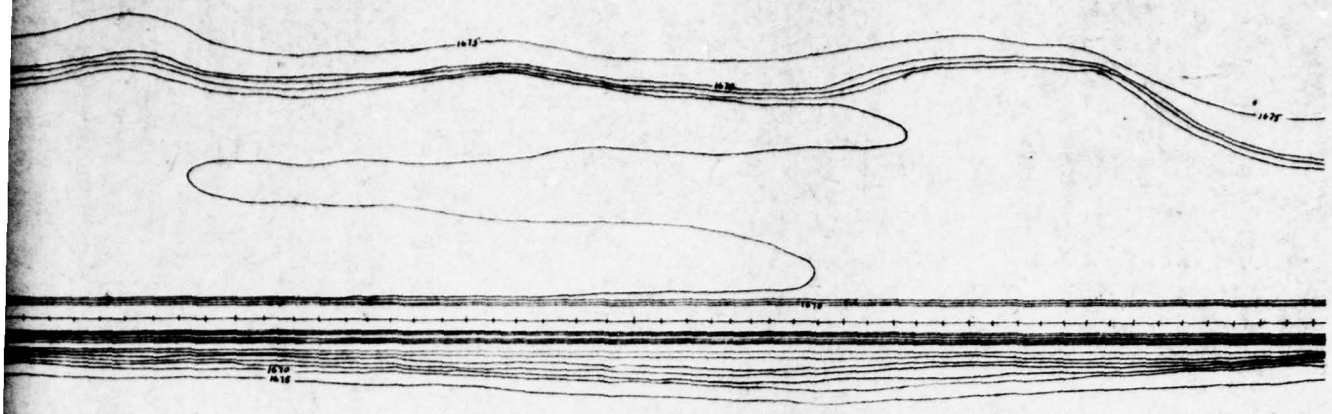
ANDOVER ROD & GUN CLUB POND
BELMONT, N.Y.
Sheet 3 of 6



PLAN
Scale 1" = 100'



Profile Thru Proposed Dam
Scale Hor. 1" = 20'
Ver. 1" = 4'



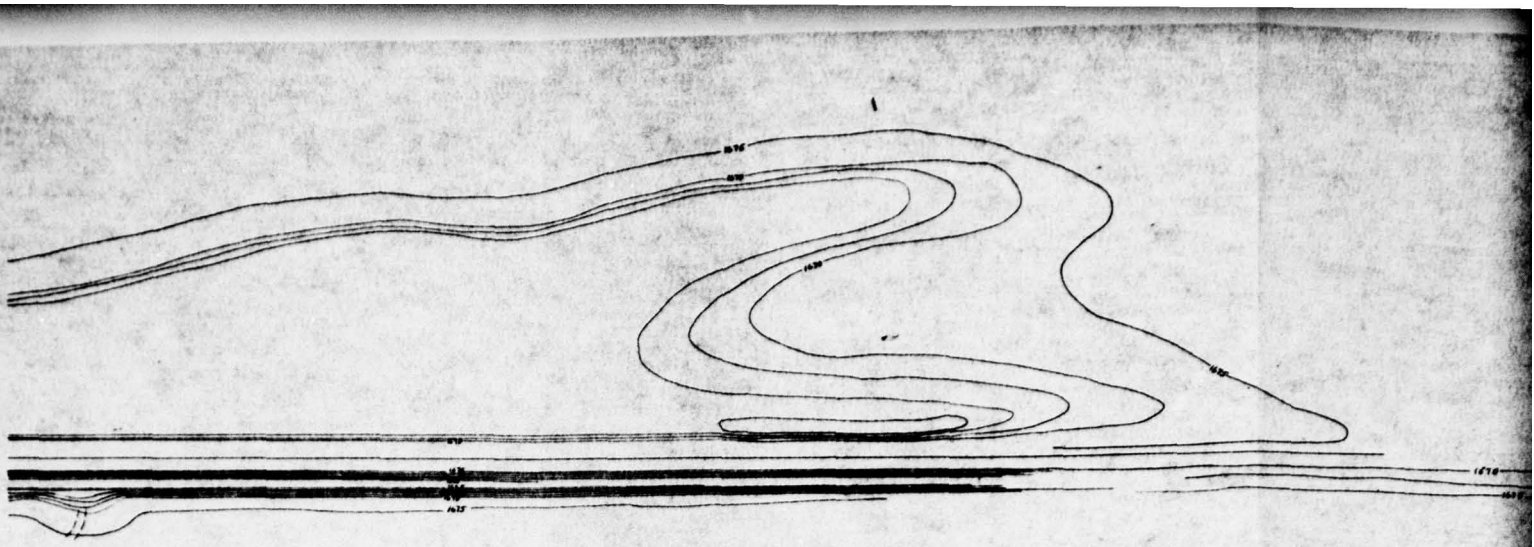
PLAN
Scale 1" = 100'

JOINS to sheet 1

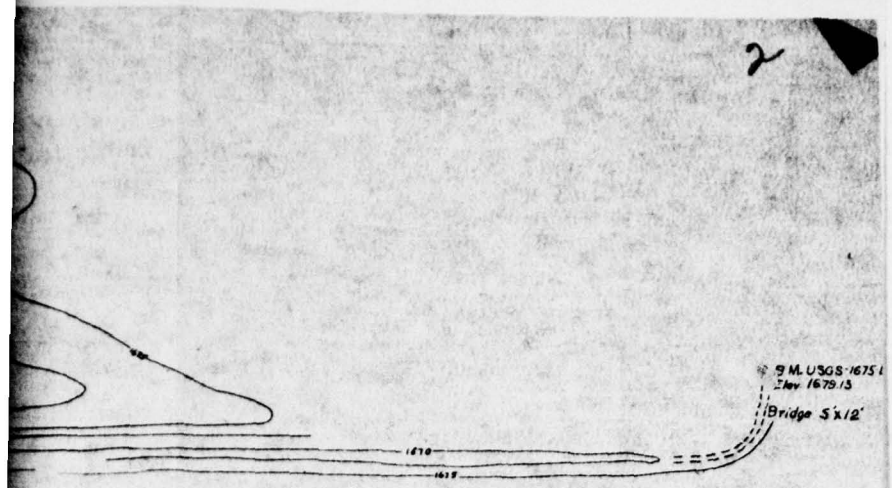
58.00

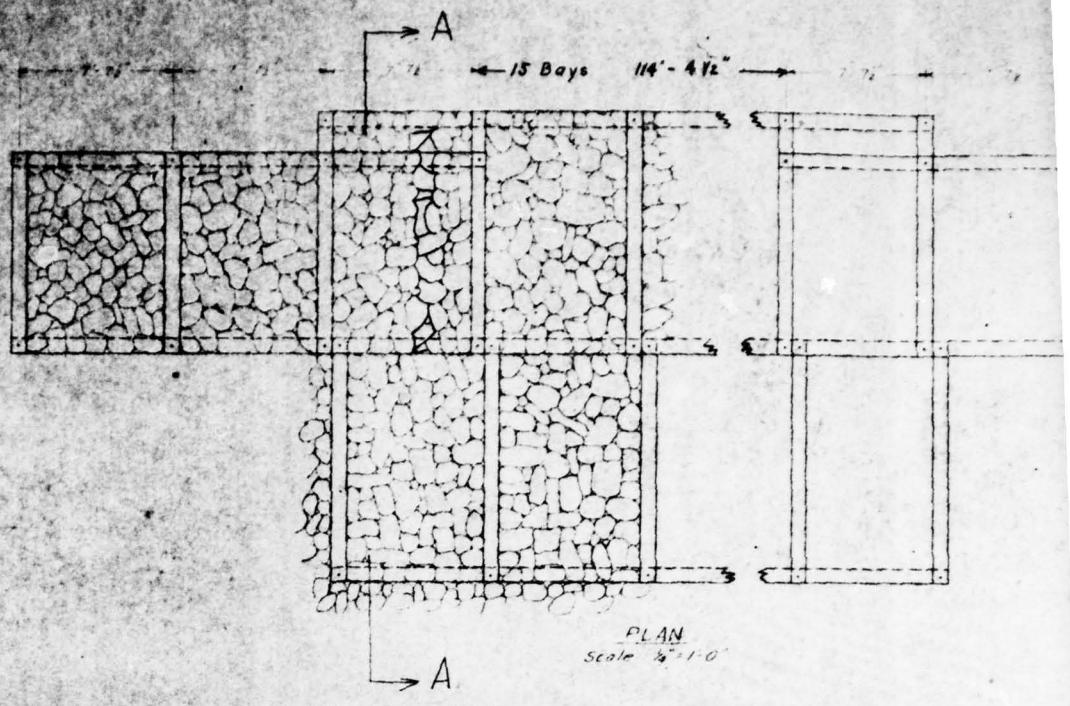
ANDOVER ROD AND GUN CLUB POND
BELMONT, NEW YORK
Sheet 2 of 6

Sheet 2 of 6

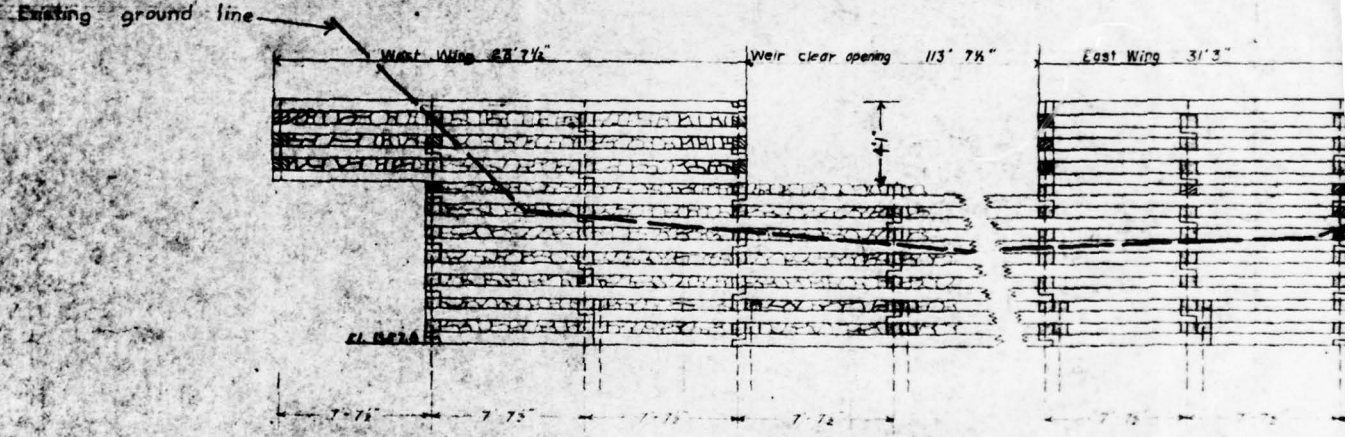


Joins to Sheet 2A


9 ML USGS-1675 L
Elev 1679.13
Bridge 5'x12'
1670
1659



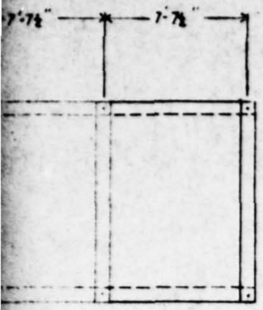
PLAN
Scale ¼" = 1'-0"

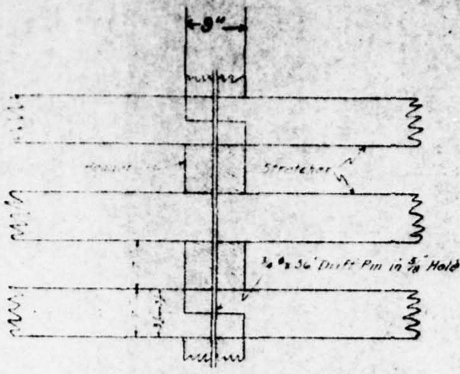


FRONT ELEVATION
Scale - ¼" = 1'-0"

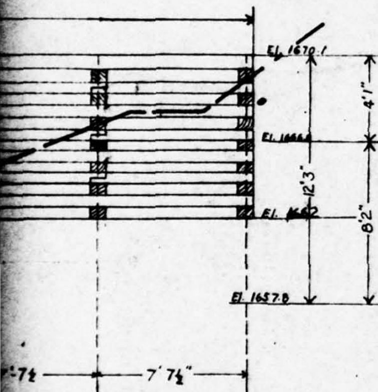
NOTES

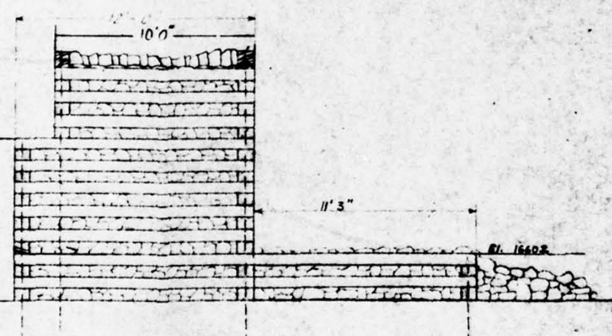
Foundation to be approved by Engineer prior to placing cribbing. Use creosote treated railroad switch ties, 7" x 9" cross section for timber cribbing. Headers to be cut to full length required and stretchers to 16 ft. lengths notched, spliced, and pinned to headers as shown in detail. Splices are to be staggered. Treated timber 8" x 8" or approximate equivalent cross-section may be substituted for switch ties. Creosote treatment 8# per cu ft. Rock fill to consist of boulders, rock fragments - 2 man size or less, preferably well graded to approximately 3" size.





TIMBER CRIB JOINT DETAIL





SECTION THRU A-A

ANDOVER ROD & GUN CLUB POND
ROCK FILLED TIMBER CRIB DAM
STATION 9+00

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

REGION 1 NORTHEASTERN REGION

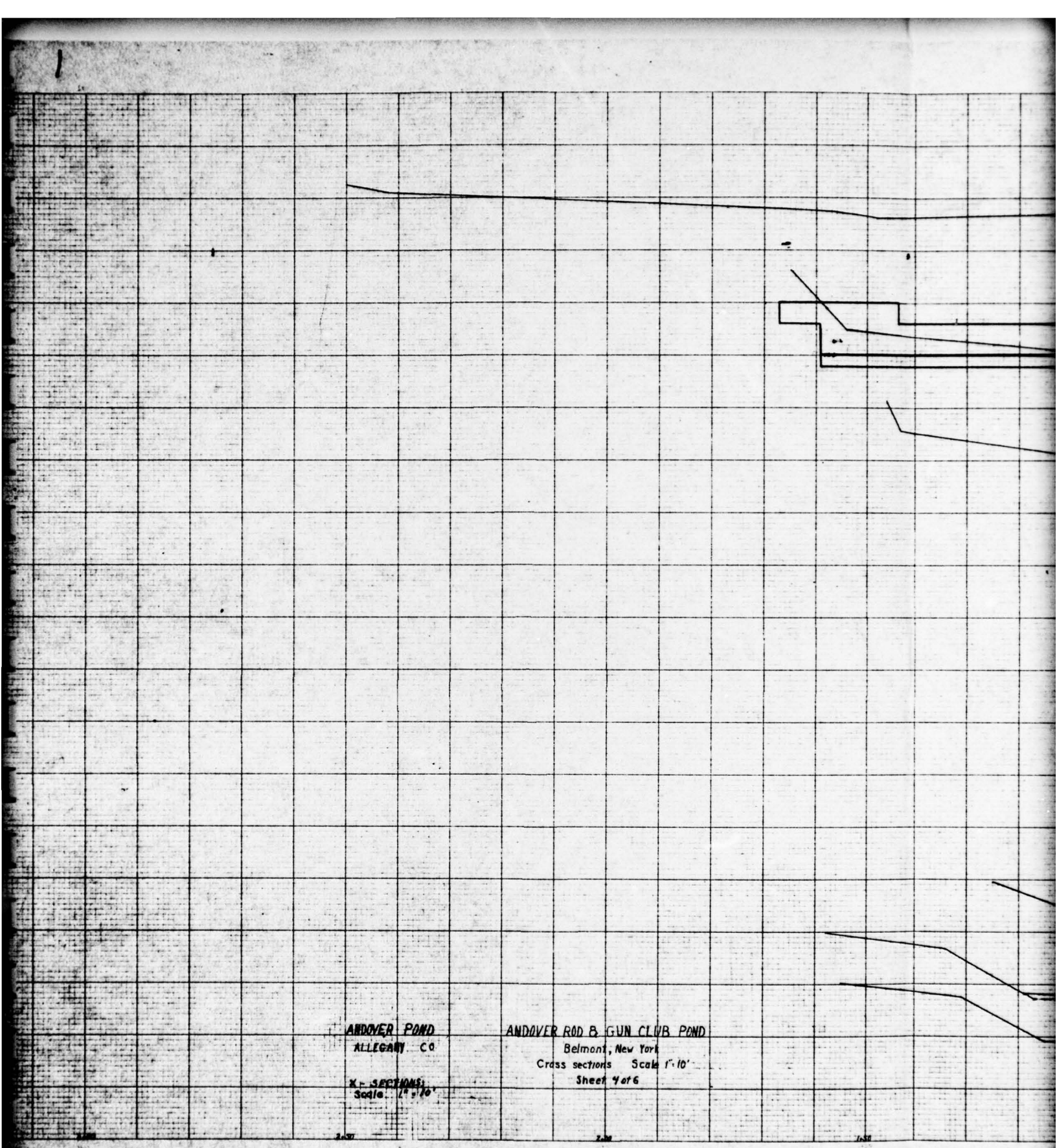
ASSISTING
ALLEGANY CO.
SOIL CONSERVATION DISTRICT
BELMONT, N.Y.

REFERENCE FIELD NOTES & B.M.'s

SURVEYED A.L.W. - H.A.D. APPROVED

COMPILED GAIN DATE DRAWING NO. R-1058

SHEET 6 OF 6



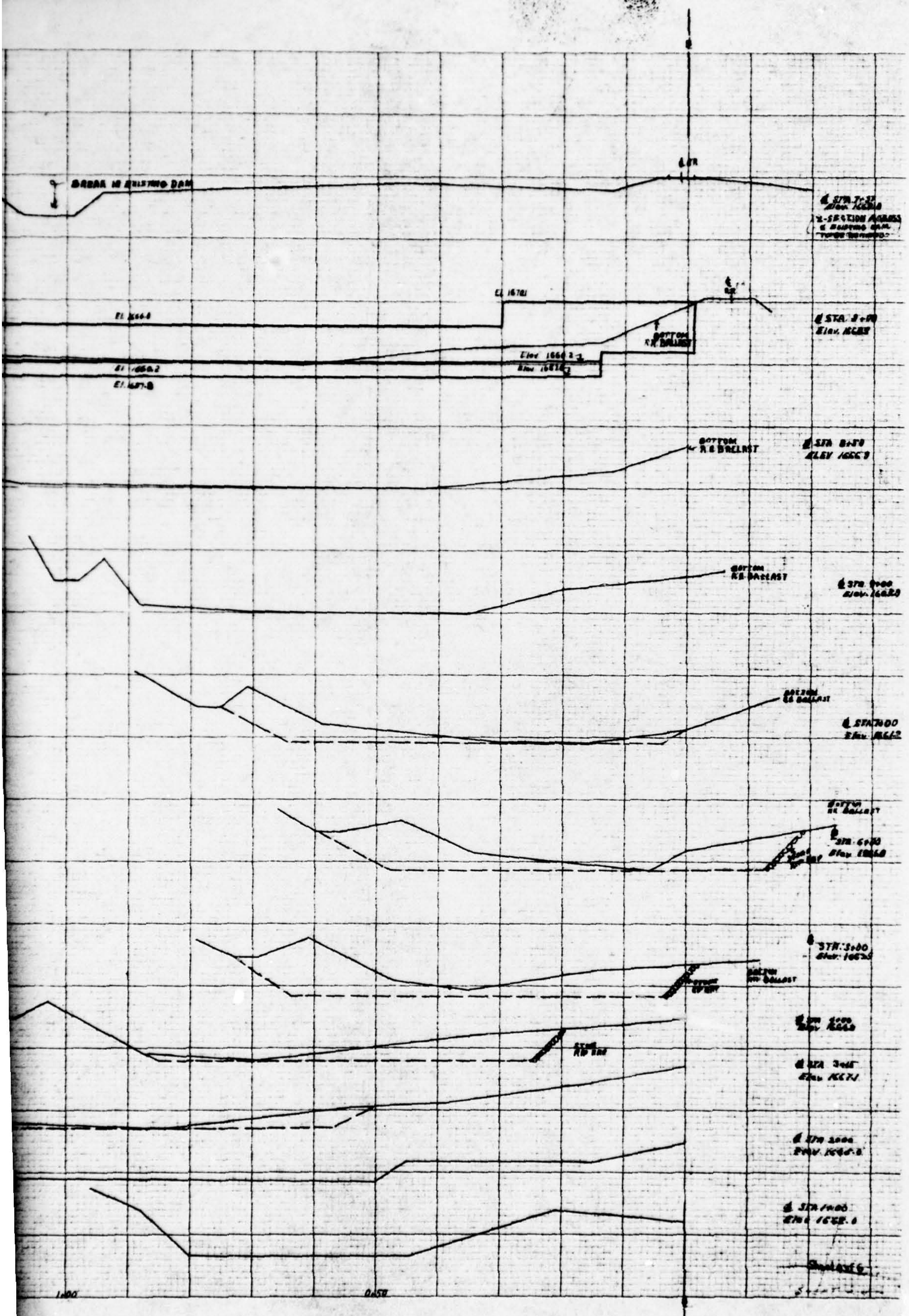
ANDOVER POND
ALLEGANY CO

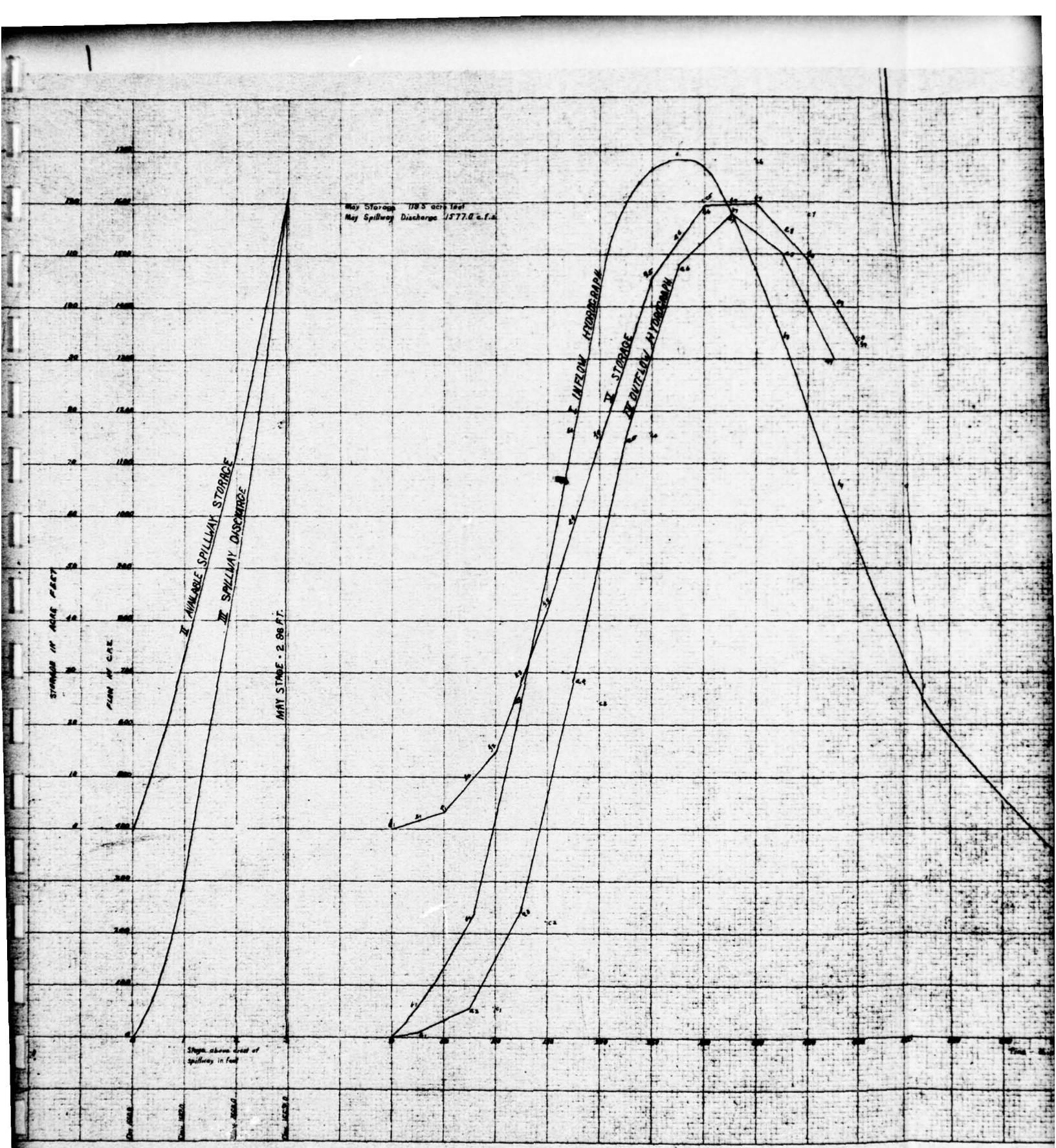
X-SECTIONS
Scale 1" = 10'

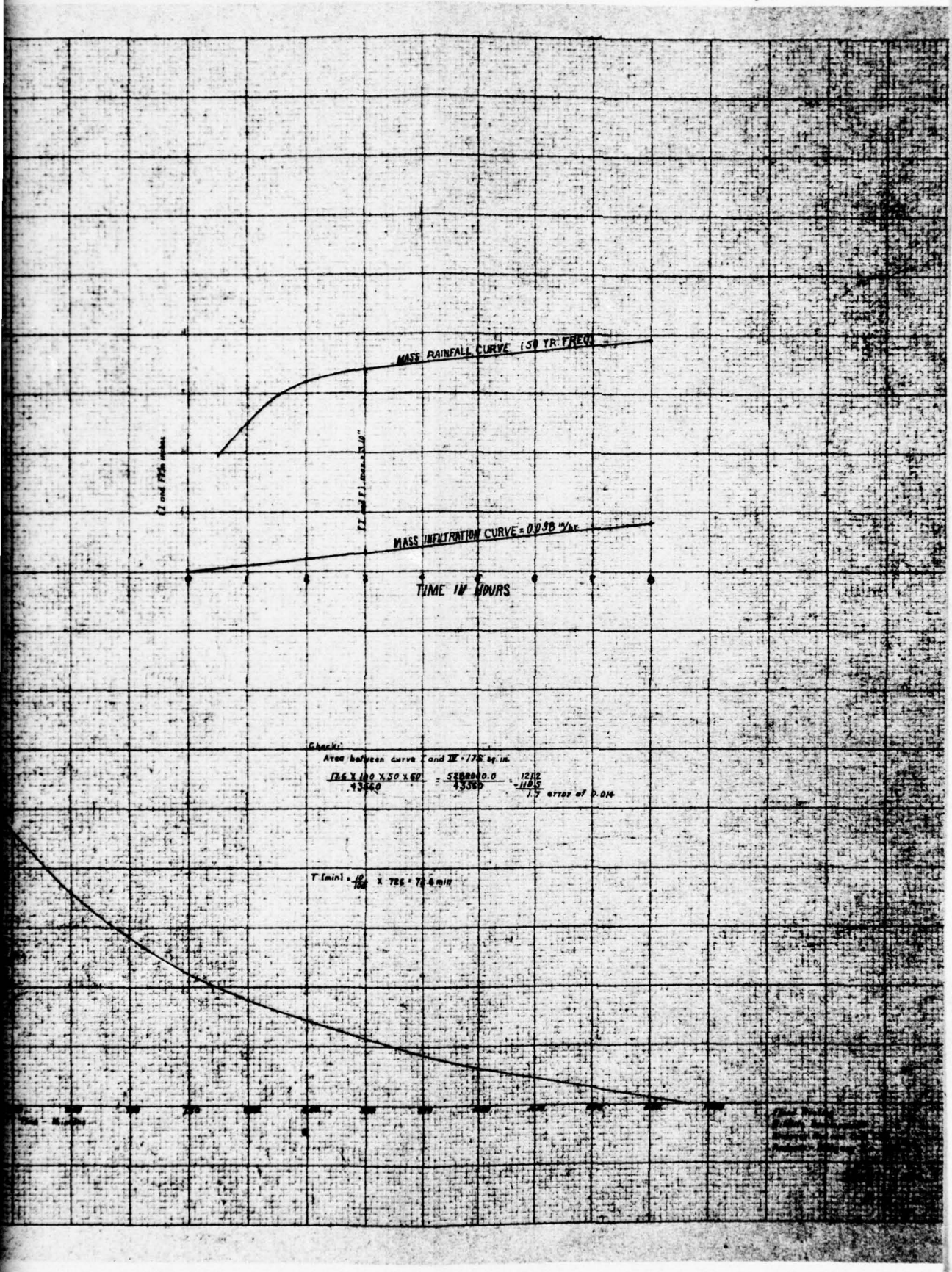
ANDOVER ROD & GUN CLUB POND
Belmont, New York
Cross sections Scale 1" = 10'
Sheet 4 of 6

BEE 10X10

2


BREAK IN EXISTING DAM
X-SECTION ACROSS
BOTTOM R.R. BALLAST
℄ STA. 8+50
℄ STA. 7+00
℄ STA. 6+00
STA. 5+00
℄ STA 3+15
℄ STA 2+00
℄ STA 1+00
1+00
0+50
10 x 10


May Storage 118.3 acre feet
May Spillway Discharge 1377.0 c.f.s.
IF AVAILABLE SPILLWAY STORAGE
IF SPILLWAY DISCHARGE
MAY STAGE = 2.88 FT.
IF INFLOW HYDROGRAPH
IF STORAGE
IF OUTFLOW HYDROGRAPH
STORAGE IN ACRE FEET
FLOW IN C.F.S.
Stage above crest of spillway in feet

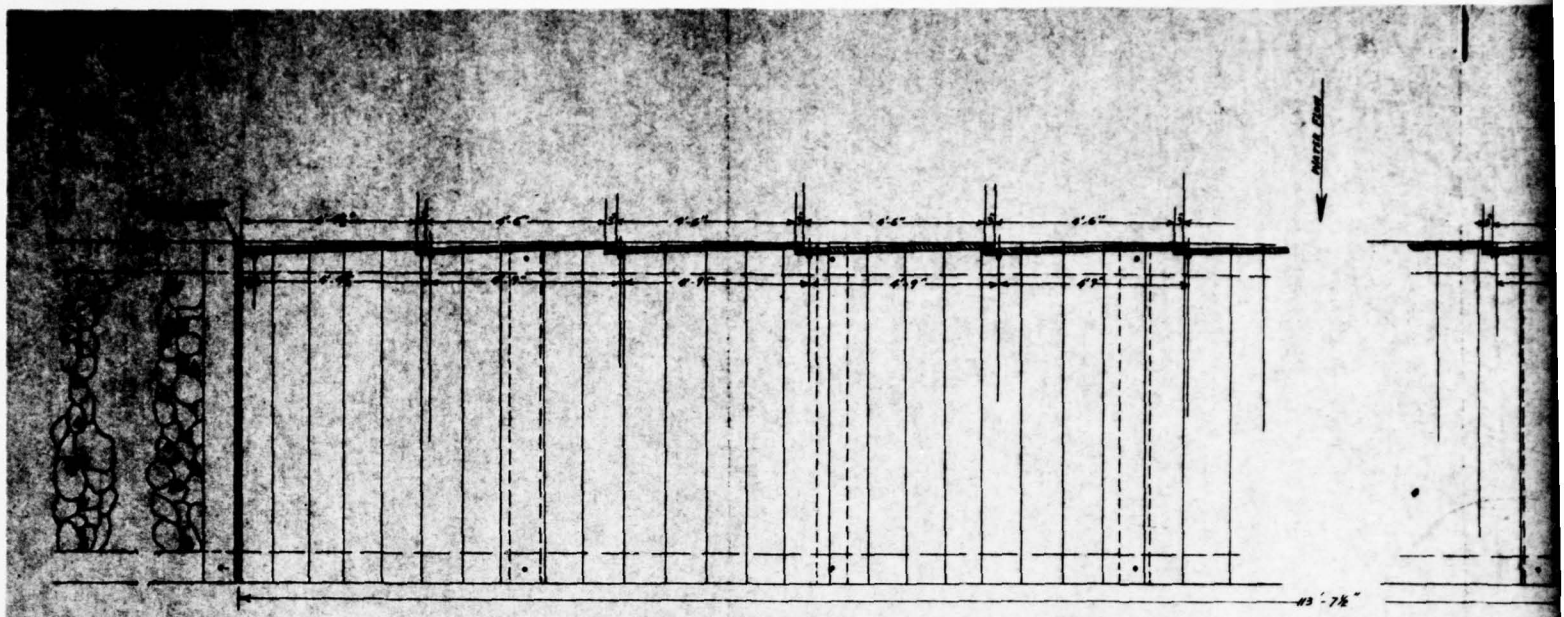


Check:
Area between curve I and II = 178 sq. in.

$\frac{726 \times 100 \times 50 \times 60}{43560} = \frac{5280000.0}{43560} = \frac{1212}{1180}$

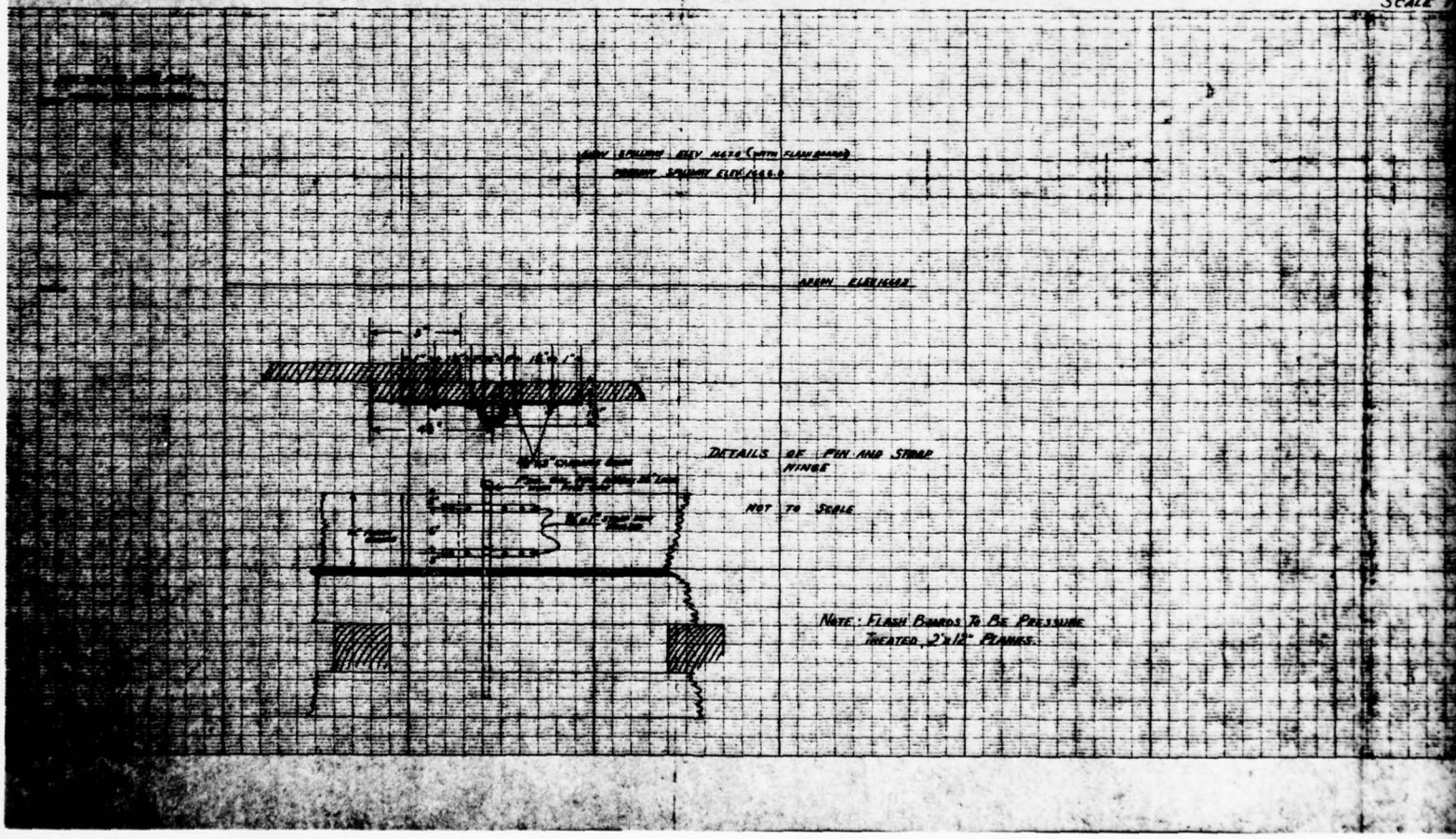
1.7 error of 0.014

$T\,(min) = \frac{10}{100} \times 726 = 72.6$ min

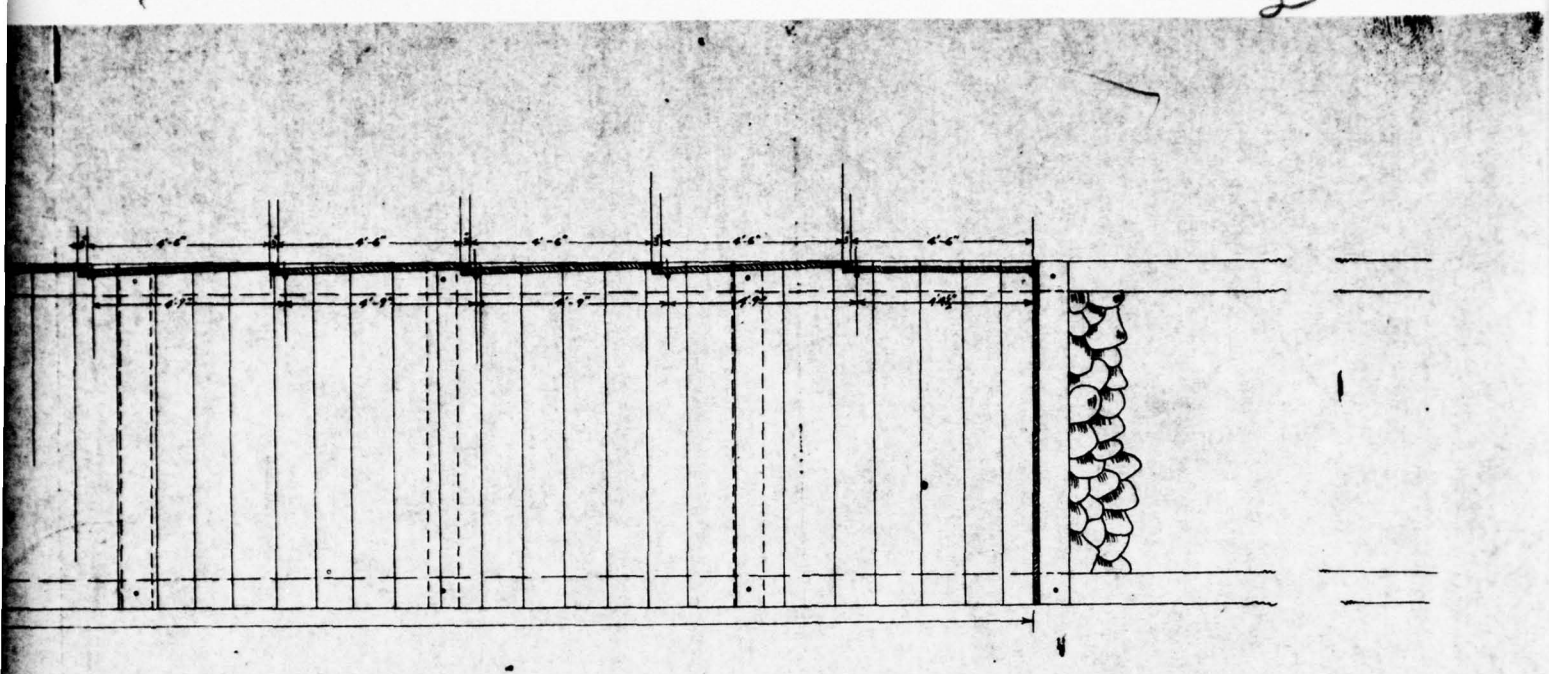


PLAN VIE

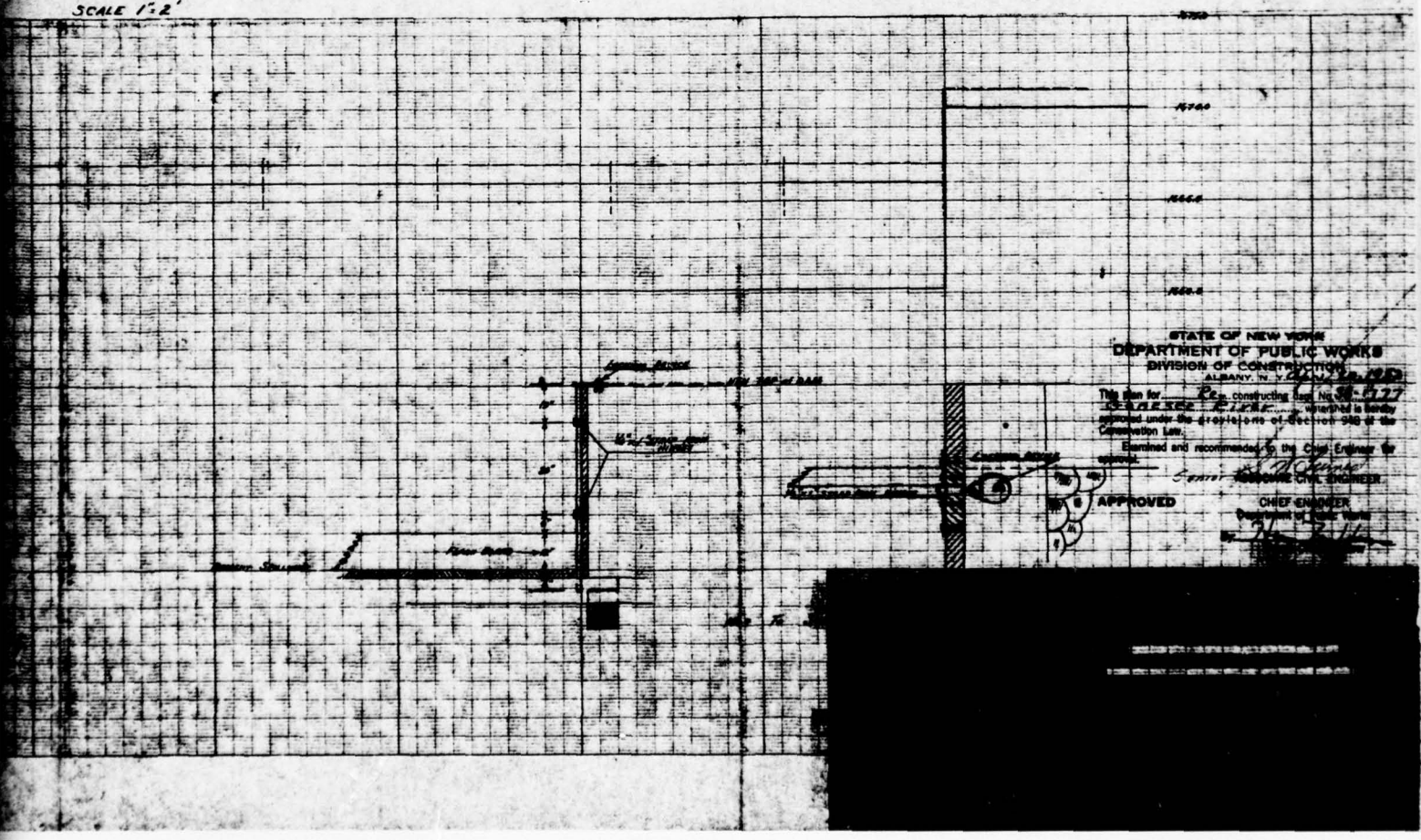
SCALE



NOTE: FLASH BOARDS TO BE PRESSURE TREATED, 2"x12" PLANKS.



PLAN VIEW
SCALE 1"=2'



APPENDIX F

VISUAL CHECK LIST

CHECK LIST
VISUAL INSPECTION
PHASE I

NAME DAM Andover Rod and Gun Club Dam COUNTY Allegany STATE New York ID# 439

TYPE OF DAM Rockfilled Timber Crib and Earthfill HAZARD CATEGORY High

DATE(s) INSPECTION August 31, 1978 WEATHER Rail, cool TEMPERATURE 65°

POOL ELEVATION AT TIME OF INSPECTION 1665.0 M.S.L. TAILWATER AT TIME OF INSPECTION 1660.8 M.S.L.

INSPECTION PERSONNEL:

R. Jeffrey Kimball, P.E. - LRK

Howard Burdick- Supervisior -Town of Andover

James T. Hockensmith - LRK

James T. Hockensmith RECORDER

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None noted	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None noted	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None noted	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Appears to be good.	
RIPRAP FAILURES	No rip rap.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appears to be good.	
ANY NOTICEABLE SEEPAGE	None noted.	
STAFF GAGE AND RECORDER	None	
DRAINS	None	

Timber Crib Dam

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Yes, all flow is passing through a hole in the middle section.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Appears to be good.	
DRAINS	None	
WATER PASSAGES	None	
FOUNDATION	Appears to be founded on the natural stream bed - soil and rock.	

Timber Crib Dam

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES		
STRUCTURAL CRACKING	Some of the timbers are broken.	
VERTICAL AND HORIZONTAL ALIGNMENT	Vertical alignment is very irregular - considerable settlement and warping of the planking.	
MONOLITH JOINTS	The timber crib section was build with approximatley 13 sections with rock placed inside cribbing. Right abutment has about 1 foot of rock washed out or settled along top.	
CONSTRUCTION JOINTS		
STAFF GAGE OF RECORDER:	None	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Near left abutment of timber crib section is an inoperative 8" steel pipe to help draw down reservior.	
INTAKE STRUCTURE	Concrete box - filled with sediment.	
OUTLET STRUCTURE	None	
OUTLET CHANNEL	Natural streambed	
EMERGENCY GATE	None	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	The timber crib section acts as a broad crested (102'long) weir. Planks form weir - poor condition.	
APPROACH CHANNEL	None	
DISCHARGE CHANNEL	None - natural stream	
BRIDGE AND PIERS	None in immediate area.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Narrow channel through the northwest part of Andover.	
SLOPES	Steep in channel.	
APPROXIMATE NO. OF HOMES AND POPULATION	Town of Andover - 20 homes, 100 people.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderately steep	
SEDIMENTATION	Considerable against upstream face	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

APPENDIX G

ENGINEERING DATA CHECK LIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Andover Rod and Gun

ID# 439

ITEM	REMARKS
AS-BUILT DRAWINGS	None
REGIONAL VICINITY MAP	None
CONSTRUCTION HISTORY	None
TYPICAL SECTIONS OF DAM	SCS Drawings
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHANCE RATINGS	SCS Drawings
RAINFALL/RESERVOIR RECORDS	None

ITEM	REMARKS
DESIGN REPORTS	None
GEOLOGY REPORTS	None
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS	SCS Drawings - hydrograph
DAM STABILITY	
SEEPAGE STUDIES	None
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None
POST-CONSTRUCTION SURVEYS OF DAM	None
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Dam reconstructed 1951 with timbers after apparent failure.
HIGH POOL RECORDS	Unknown
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Details unknown - "Break in Dam" shown on SCS drawings
MAINTENANCE OPERATION RECORDS	None

REMARKS	
SPILLWAY PLAN SECTIONS DETAILS	SCS Drawings
OPERATING EQUIPMENT PLANS & DETAILS	None

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Wooded and pasture land 5.47 square miles.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1666.0 (118 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N/A

ELEVATION MAXIMUM DESIGN POOL: 1669.0

ELEVATION TOP DAM: 1670.1

CREST:

a. Elevation 1666.0
b. Type Broad crested weir
c. Width 9.5'
d. Length 102'
e. Location Spillover Entire timber crib section
f. Number and Type of Gates None

OUTLET WORKS:

a. Type One 8" steel pipe
b. Location left abutment of timber crib section
c. Entrance inverts 1665.0
d. Exit inverts 1665.0
e. Emergency draindown facilities None

HYDROMETEOROLOGICAL GAGES:

a. Type None
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE Unknown